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SELECT EXTRA-TROPICAL PLANTS,

READILY ELIGIBLE FOR

Industrial Culture or Naturalisation,

WITH INDICATIONS OF THEIR NATIVE COUNTRIES AND SOME OF THEIR USES;

BY

BARON FERD. VON MUELLER,

K.C.M.G., M.D., PH.D., F.R.S., F.L.S., F.G.S., F.C.S., F.R.G.S., C.M.Z.S., H.M.R.H.S., H.C.M.S.A., H.F.R.B.S., H.M.G.S.E., H.M.B.S.E. ETC.

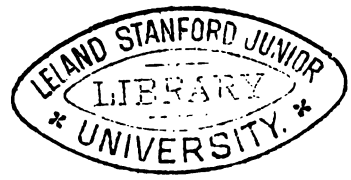
GOVERNMENT BOTANIST FOR VICTORIA.

"Omnia enim in usus suos creata sunt."—SYRACH, XXXIX., 21,26.

Eighth Edition, Revised and Enlarged.

MELBOURNE: PRINTED FOR THE GOVERNMENT OF VICTORIA BY CHAS. TROEDEL AND CO., COLLINS STREET.

1891.



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PREFACE.

In the volumes, issued by the Victorian Acclimation-Society from 1871 to 1878, five contributions have appeared concerning such industrial plants, as are available for culture in extra-tropical countries or in high mountain-regions within the tropics. These writings were mainly offered with a view of promoting the introduction and diffusion of the very many kinds of utilitarian plants, which may be extensively reared in the forests, fields, pastures or gardens of temperate geographic latitudes. But the work thus originated became accessible merely to the members of the Society, while frequent calls arose for these or some similar data, not only throughout the Australian communities, but also abroad. The whole was therefore re-arranged and largely supplemented, first for re-issue in Victoria and later also for publication in India, there under the auspices of the Central Government at Calcutta. Subsequently the work was likewise honored by being reprinted, with numerous additions, for the use of New South Wales; and at nearly the same time it went through a German translation, by Dr. Goeze, in Herr Th. Fischer's publishing establishment of Cassel. In 1884 it appeared revised and still further augmented, more particularly for North-American use, through the generous interest of one of the most enterprising scientific publishers in the United States, Mr. George Davis of Detroit. Three Victorian editions having become exhausted, the present one is offered now, still further enlarged by such notes, as could be added very recently. As stated in the preface to the original essays, they did not claim completeness, either as a specific index to or as a series of notes on the respective rural or technologic applicability of the plants enumerated. But what these writings may perhaps aspire to, is to bring together some condensed data in popular language on all the principal economic plants, hitherto known to prosper beyond the equinoctial zone. Information of this kind is widely scattered and often only accessible through voluminous and costly works in various languages; furthermore, such volumes may

apply only to countries with a climatic zone far narrower than that, for which these pages were written. Many, but not all the books, which it was desirable to consult, were at the author's command; thus the necessity of further successive supplements will be apparent, even irrespective of needful references to future discoveries; because in the progress of geographic, rural, medical, technologic and chemical inquiries many new plants are likely to be disclosed, and additional uses of known plants to be elucidated. Thus, for instance, among the trees and shrubs, or herbs and grasses, occurring in the middle and higher altitudinal zones of Central Africa, or nearer to us of New Guinea and the Sunda-Islands, many specific forms may be expected to occur, which we could advantageously transfer to any extra-tropical countries or to mountains in other equatorial regions. Moreover the writer would modestly hope, that his local efforts may prove to be useful also in other parts of the globe for extending rural pursuits; indeed, through the generous action of an enlightened American, Capt. Ellwood Cooper, President of the State-Board of Horticulture of California, the first fragmentary publications, then offered for Australian use, were deemed worthy of re-issue in San Francisco. Gradual or partial reprints had also previously appeared in weekly journals of Sydney and San Francisco and in some other periodicals, some under re-arrangement. But notwithstanding various suggestions, offered to the writer, he has seen no reason to deviate in the slightest from the original plan of the work; nor seems the title of the book assailable; for although the number of recorded plants is large, they still remain quite "select," inasmuch as they form only a remarkably small percentage of the species, which constitute the universal Flora of the world. The author feels proud, that Professor Naudin, a great leader in scientific cultivations, has adopted this book in a somewhat altered and enlarged French form more especially for the use of the countries on the Mediterranean Sea (*Manuel de l'acclimateur*, 1887). Some ruralists have thought, that various plants, here alluded to as promising, were not deserving of any efforts to acquire them. In answer we may single out the instance of Vacciniums. How here we also would delight in seeing naturalised all over the Australian Alps every one indeed of the numerous species, affording edible fruit—however small—all entirely new for this part of the world, and surely some as capable of cultural improvement, as

strawberries and others of our most relishable table or kitchen-fruits, partly arisen from quite unpromising stock. Furthermore as methodic forestry is as yet limited everywhere to indigenous kinds of trees, except in India and at the Mediterranean Sea, where Eucalypts much through initiating early efforts of the writer became reared on a forestral scale, it may be presumed, that the present pages will also aid in vastly amplifying forest-operations by transfers of peculiarly superior kinds of sylvan trees from hemispheres to hemispheres in a truly cosmopolitan spirit, so far as this can be carried out within climatic scope, renewal and even originating of forests becoming anyhow so needful in many regions of the world. In numerous instances the author has preferred to quote the statements of others on the value of various culture-plants, than advancing opinions from his own experience, even when they were quite coinciding; but in most cases such notes had to be much abridged, to render the volume concise, readily portable, quite inexpensive and quickly useable.

As already intimated, the rapid progress of tillage almost throughout all colonial dominions and in other new States is causing a growing desire for general and particular indications of such plants, which a colder clime excludes from the northern countries, in which many of the colonists spent their youth; and it must be clear to any reflecting mind, that in all warmer latitudes, as compared with the Middle-European region, is existing a vastly enlarged scope for cultural choice of plants. Thus, indicative as these notes merely are, they may yet facilitate the selection. More extensive information can then be sought for in larger and expensive, though less comprehensive and handy works already extant, or likely still to be called forth by local requirements in other countries. The writer should even not be disinclined under fair support and encouragement, to issue collateral to the present volume also another, exclusively devoted to the industrial plants of the hotter zones, for the promotion of tropical culture, particularly in our Australian continent.

Considerable difficulty was experienced in fixing the limits of such remarks, as are at all admissible into the present pages, because certain plants may be important only under particular climatic conditions and cultural applications, or their importance may have been overrated in regard to the copiousness and relative value of their

yield. It was, therefore, not always easy, to "sift the chaff from the grain," when these notes were gathered; the remarks, offered in this work, might indeed under less rigorous restrictions have been indefinitely extended; and although the author has for more than twenty years been watching for industrial tests the plants, introduced by him into the Melbourne Botanic Garden, and has for nearly as long a time of travels been scrutinising the circumstances of the spontaneous occurrence for vast multitudes of species, he had still to a very large extent to rely implicitly on the experience of other observers elsewhere. It may also at once be stated here, that when calculations of measurements and data of weights were quoted, such always represent, if not already anyhow absolute, the maximum as far as hitherto on record. It was not always found easy, to determine with accuracy the geographic range of the species for this work in brief terms, as even some of the best and newest taxologic books on plants relate not with sufficient distinctness, what is truly indigenous and what merely naturalised in any particular part of the globe. Furthermore schematic indices, to facilitate general views over the geographic distribution of plants, such as given for Australia in "a systematic census of plants with geographic and literary annotations," have not as yet been forthcoming for any of the other great divisions of the earth with completeness, although Nyman has published a full list of European plants with mentioning of the countries of their nativity there. To draw prominent attention to the primarily important among the very many hundreds of plants, referred to in these pages, the leading species have been designated with an asterisk. It has not been found easy in numerous instances, to trace the original source of whatever information on utilitarian plants we find recorded in the various volumes of phytographic or rural or technologic literature; many original observations are however contained in the writings, accessible here, of Bernardin, Bentham, Bentley, Boehner, Brandis, Brockhaus, Candolle, Chambers, Collins, Drury, Engelmann, Engler, Flueckiger, Fraas, Goeze, Asa Gray, Grisebach, Hanbury, Hilgard, Hooker, Husemann, King, Koch, Langethal, Lawson, Lindley, Lorentz, Loudon, Maiden, Martius, Masters, Meehan, Meyer, Michaux, Naudin, Nuttall, Oliver, Pereira, Philippi, Porcher, Rosenthal, Roxburgh, Sargent, Seemann, Semler, Simmonds, Stewart, Trimen, Wiesner, Wittstein and others, to whose names reference is

cursorily made in the text. The volumes of the Agricultural Department at Washington, the Austrian Apotheker-Verein, the Journal of Applied Science, the Bulletin de la Société d'Acclimatation de France, the Gardeners' Chronicle, the Anales de la Sociedad rural Argentina, the Revue Agricole of Mauritius, the Indian Forester, the Journal of the Society of Arts, Therapeutic Gazette, Dyer's Kew Bulletin, Christy's New Commercial Plants, Progress Reports of the Victorian Royal Commission on Vegetable Products edited by Mr. J. J. Shillinglaw, the Garten-Flora, the Wiener Garten-Zeitung and several other periodicals have likewise afforded data, utilised for this work. B. D. Jackson's "Vegetable Technology," up to 1882, is an admirable guide to the vast literature in this direction. The four volumes of Dr. Watt on the economic products of India, hitherto issued, have likewise been consulted. Many therapeutic notes have been obtained from the recent works of Bartholow, Brunton and Phillips. Special praise should be bestowed on the great Kew-establishment for originating or sustaining the culture of so many new plants, particularly in the British colonies.

In selecting notes from general rural literature great caution had to be exercised, to guard against being misled by perhaps sometimes faulty nomenclature. Furthermore, in choosing or elaborating the data for entries into this work, it had constantly to be kept in view, that the information is intended for the bread-winning portion of communities in young colonies mainly if not exclusively; little beyond this is aimed at. Consummate discrimination had therefore to be exercised to circumscribe the information offered in this plain book. Mischief may also be done by careless introductions; thus Madia may be singled out as an instance of a very invasive and therefore objectionable weed avoided by pasture-animals, although it continues to be much praised up as an oil-plant. Indigenous plants of special local value and not easy restoration are often neglected here and elsewhere. What may another century have to say about their indiscriminate annihilation? More rotation of crops will ward off various diseases of plants, and this without impairment of remunerativeness of harvests. Soil-analysis should precede manuring in any kinds of culture, so as to render that operation always most rational.

In grouping together at the close of this volume all the genera, enumerated according to the products, which they yield, facility is afforded for tracing out any series of plants, regarding which special economic or technic information may be sought, or which may at any time prominently engage the attention of the cultivator, the manufacturer or the artisan. Again, by placing together in index-form the respective industrial plants according to their geographic distribution, as has likewise been done in the concluding pages, it is rendered easy, to order or obtain from abroad the plants of such other countries, with which any settlers or colonists may be in relation, through commercial, literary or other intercourse. Lists like the present may also help in naming plants and their products with scientific correctness in establishments of economic horticulture or for technologic or other educational collections. If the line of demarcation between the plants, admissible into this list, and those, which should have been excluded, has occasionally been extended in favour of the latter, then it must be pleaded, that the final value of any particular species for a peculiar want, locality or treatment cannot always be fully foretold. Doubtless, many plants of primary importance for rural requirements, here again alluded to, have long since been secured even for new colonies by intelligent early pioneers of immigration, who timely strove to enrich the cultural resources of their adopted country. In these efforts the writer, so far as his public or private means would permit has endeavoured for more than a third of a century to take an honorable share. But although many such plants may have been introduced, they are not in all instances as yet widely diffused, nor tested in all desirable localities and for all needful purposes; thus for the sake of completeness even the most ordinary cultural plants have not been passed, as the opportunity seemed also an apt one, to offer some cursory remarks on their respective value. Even the geographic limitation of the work nominally to extra-tropic regions involves a somewhat arbitrary admission or exclusion of those intratropical plants, which occupy cooler mountain-regions, and those which extend even from low lands almost within the equinoctial zones fully to both tropical circles of geographic demarcation. An armfull of hay or straw may help many a tender seedling over the first cool season, or a bit of brush may shelter infant-plants against scorching in the first summer. In fact, a work like this can pass only

strictly equatorial and sub-equatorial lowland-plants, the isothermal lines not rarely receding much from those of geographic latitude, as for instance here in Eastern Australia. In viewing some of the recommendations, contained in these pages, the prospect of remunerativeness may seem scant; yet it should not be forgotten, that vast saving of labour is affected nowadays through machinery becoming more and more ingeniously perfected quite as much for rural purposes, as for application to the printing process, to paper-making, sugar-production, sewing and many other kinds of work in technology or even domesticity. Thus assuredly we are not to continue for ever all the tedious manual operations in tea-manufacture, perfume-isolation and other industrial operations; indeed, the changes for expediting technic processes and for saving raw material have been great already, more particularly so within the last few decades. Vernaculars have been but sparingly used, being so often of duplicity or even multiplicity in their application, and so frequently also misleading; for instance the word "Cow-Berry," though intended for a literal translation of Vaccinium, is so utterly devoid of any meaning, that Wittstein argued, it should be altered into Baccinium. Really we should strive to simplify nomenclature, and should reduce popular names to such solitary and logic expressions, as most readily can be understood in each instance. Thus it is as easy, to bear in memory the word Casuarina as the very objectionable appellations Sheoak and Heoak. So much Botany might or should be taught henceforth at any evening elementary school, that the latin or greek names of the principal utilitarian plants of the world become universally understood. But whoever likes to render himself fully acquainted with English or any other provincialisms of plants, can readily refer to W. Ulrich's and to W. Miller's special dictionaries, both of comparatively recent date. The fact, that this work through successive editions and extensive issues came into use over a large portion of the world, whether for educational or rural or journalistic or touristic wants, has been most gratifying to the writer; but this brightness is dimmed by the circumstance that the book has not unfrequently been used even in public departments with perhaps unintentional evasion of all literary or any other acknowledgment. Nor did hardly ever words of appreciation reach the author from wherever rural successes were gained from even practical exertions of his own.

The writer entertains a hope, that a copy of this plain volume may find also a place in the libraries of any of our schools and mechanics' institutes for occasional and perhaps frequent reference to its pages, and that it may further become available on board of ships and otherwise to travellers and immigrants, so that the varied wideness of cultural range in mild climates—as yet so imperfectly understood—may more fully and readily be recognized, particularly also for the advantage of these southern colonies. The increased ease of communication, which more latterly has arisen between nearly all parts of the globe, places us here also now in a fairer position for independent efforts, to suggest or promote introductions of new vegetable treasures from unexplored regions, or to submit neglected plants of promising value to unbiassed original tests. It may merely be instanced, that after the lapse of more than three centuries since the conquest of Mexico, only the most scanty information is extant on the timber of that empire, even in reference to its numerous kinds of splendid oaks, and that of several thousand species of tropical grasses not many dozen have been tried as yet with rural or chemical exactitude for pasture-purposes, not to speak of a multitude of prominently utilitarian trees, shrubs and herbs, restricted to temperate mountain-regions within the tropics, but never yet carried to the lowlands of higher latitudes. For inquiries of such kind every civilised State should strive to afford in well planned, thoughtfully directed and generously supported special scientific establishments the needful aid, not merely for adding to the prosperity, comfort and enjoyment of the present generation, but also with an anticipation of earning the gratitude of posterity; and this ought to be done with a sensitive jealousy, to maintain also thereby the fair fame of any country for scientific dignity and industrial development. Friendly consideration will recognise the fact, that a desire, to arouse more and more such a spirit of emulation, has much inspired the writer to offer these pages, he trusting, that enlightened statesmanship far and wide will foster the aims, which he has had in view, through liberal, energetic and circumspect support.

Melbourne, April, 1891.

SELECT PLANTS,

READILY ELIGIBLE FOR INDUSTRIAL CULTURE AND NATURALISATION.

IN

EXTRA-TROPICAL COUNTRIES.

Aberia Caffra, J. Hooker and Harvey.

The "Kei-Apple" of Natal and Caffraria. This tall shrub serves well for hedges; it bears only slight frost, but resists severe droughts. The rather large fruits are acid, and when boiled edible, and can also well be converted into preserves. Allied South-African species are A. Zeyheri and A. tristis (Sonder).

Acacia acuminata, Bentham.

A kind of "Myall" from Western Australia, attaining a height of 40 feet. The scent of the wood comparable to that of raspberries. One ton of wood yields fully 1lb. of highly fragrant oil on distillation [Capt. Noyes]. This species occurs through wide regions in vast abundance. It is the best of West-Australian woods for charcoal. The stems much sought for fence-posts, very lasting for this purpose, even when selected young. A very similar tree with hard and scented wood is A. Doratoxylon (A. Cunn), of the dry regions of South-Eastern Australia.

Acacia aneura, F. v. Mueller.

Arid desert-interior of extra-tropic Australia. A tree, never more than 25 feet high. The principal "Mulga" tree. Mr. S. Dixon praises it particularly as valuable for fodder of pasture-animals; hence it might locally serve for ensilage. Mr. W. Johnson found in the foliage a considerable quantity of starch and gum, rendering it nutritious. Cattle and sheep browse on the twigs of this and some allied species, even in the presence of plentiful grass, and are much sustained by such Acacias in seasons of protracted drought, but it is really valuable only as an admixture to fodder, as otherwise it leaves an undigested fibrous substance behind. Dromedaries in Australia crave for the Mulga as food. Wood excessively

hard, dark-brown, used preferentially by the natives for boomerangs, sticks to lift edible roots, end-shafts of Phragmites-spears, woomerangs, nulla-nullas and jagged spear-ends. Mr. J. H. Maiden determined the percentage of mimosa-tannic acid in the perfectly dry bark as 8·62.

Acacia Arabica, Willdenow.

The "Kikar" or "Babool." Northern and Central Africa, also in South-Western Asia, growing in dry, calcareous soil. The Egyptian Acacia of Dioscorides, Plinius and Virgilius. This small tree can be utilized for thorny hedges. It furnishes one of the best kinds of gum arabic for medicinal and technical purposes. Pasture-animals devour the leaves. The lac-insect lives also on the foliage, and thus in Sind the lac is mainly yielded by this tree. The stem attains exceptionally a circumference of 10 feet. The astringent pods are highly valuable for tanning, also the bark, which is known as "Babool" bark, and produces leather of peculiar paleness; the wood is very durable if water-seasoned, extensively used for wheels, well-curbs and many kinds of implements, also for the knees and planks of boats. This species is of comparatively quick growth; A. vera and A. Nilotica are varieties of it. The import of gum arabic into Britain during 1886 was 75,591 cwt., valued at £295,464. A. Ehrenbergiana (Hayne) is among the species, which yield gum arabic in North-Africa. A. latronum (Willdenow) and A. modesta (Wallich) form thorny hedges in India according to Sir D. Brandis.

Acacia armata, R. Brown.

Extra-tropical Australia. The Kangaroo-Thorn. Much grown for hedges, though less manageable than various other hedge-plants, and not so fire-proof. More important for covering coast-sand with an unapproachable prickly vegetation.

Acacia binervata, De Candolle.

Extra-tropical East-Australia. A tree attaining a height of 40 feet. The bark used by tanners, but not quite so valuable as that of A. decurrens [W. Dovegrove], although Mr. J. H. Maiden determined the percentage of mimosa-tannic acid in perfectly dried bark as 30.4. The wood is light-colored, close-grained and easily worked.

Acacia Catechu, Willdenow.

India to East-Africa, up to 5,000 feet. A tree, attaining 40 feet in height. Will bear some frost [Brandis]. Wood hard, heavy, extremely durable, locally chosen for underground-posts particularly and mill-work. The extract, prepared from the bark and heart-wood, is one of the catechus of medicine or cutch of tannery. Pure cutch is worth about £25 per ton; 4 tons of bark will produce 1 ton of cutch. A. Suma (Kurz) is closely allied. The two

other principal kinds of catechu are tropical products from Areca Catechu and Nauclea Gambir, that of the latter being obtained from some congeners also. The import of cutch and gambir into the United Kingdom during 1886 was 28,352 tons, valued at £654,218.

Acacia Cavenia, Hooker and Arnott.

The "Espino" of the present inhabitants of Chili, the "Cavan" of the former population. A small tree with exceedingly hard wood, resisting underground moisture. The plant is well adapted for hedges. The husks contain 32 per cent. tannin [Sievers], particularly valuable as a dye-material.

Acacia concinna, De Candolle.

India, China. Praised by Dr. Cleghorn as a valuable hedge-shrub. The pod contains saponin.

Acacia dealbata, Link.

South-Eastern Australia and Tasmania. This tree is generally known amongst Australian colonists as Silver-Wattle. It prefers for its habitation humid river-banks, and sometimes attains there a height of 150 feet, supplying a clear and tough timber used by coopers and other artisans, but principally serving as select fuel of great heating power. From the thinly-split wood elegant baskets can be made. The bark of this tree is thinner and inferior in quality to that of the Black Wattle, yielding generally much less quantity of tannin-principle. Mr. J. H. Maiden determined the average proportion of mimosa-tannic acid in absolutely dry bark as 21.22 against 30.08 of A. mollissima. He relies on the color-reaction, given by a drop of concentrated sulphuric acid, as the most valuable for roughly ascertaining the strength of tan-samples; that from the rich wattle barks gives rose-madder color, and all give shades of color proportionate in tint to the percentage of tannin. Bark chiefly employed for lighter leather. This tree is distinguished from the Black Wattle by the silvery or rather ashy hue of its young foliage; it flowers early in spring, ripening its seeds in about 5 months, while the Black Wattle occurs chiefly on drier ridges, blossoms late in spring or at the beginning of summer, and its seeds do not mature in less than about 14 months. This hardy Acacia could doubtless, for tan purposes, be remuneratively reared so far north as the Channel-Islands. It bears more cold than A. decurrens, A. mollissima and A. pycnantha.

Acacia decurrens, Willdenow.*

The Sydney Tan-Wattle. New South Wales and southern part of Queensland, rare in Victoria. A middle-sized tree. Its wood is used for staves, for turners' work, occasionally also for axe, and pick-handles and many other purposes; it supplies an excellent firewood; a chief use of the tree would be also, to afford the first

shelter in treeless localities for raising forests where no severe frosts occur. Its bark, rich in tannin, and its gum, not dissimilar to gum arabic, render this tree highly important. The typical A. decurrens with longer leaflets, rises seldom above 30 feet; it has, according to the Hon. Dr. J. Cox, a bark of less tannic strength than A. mollissima, also is of quicker and taller growth; its flowering time is between that of A. dealbata and A. mollissima. The English price of the bark ranges generally from £10 to £14. In Melbourne it averages about £7 to £10 per ton. It varies, so far as experiments made in my laboratory have shown, in its contents of tannic principle from 30 to 40 per cent. in bark completely dried, but this is not all pure tannic acid. In the mercantile bark the percentage is somewhat less, according to the state of its dryness, it retaining about 10 per cent. moisture. $1\frac{1}{2}$ lbs. of Black Wattle-bark give 1 lb. of leather, whereas 5 lbs. of English Oak-bark are requisite for the same results; but the tannic principle of both is not absolutely identical. Melbourne tanners consider a ton of Black Wattle-bark sufficient to tan 25 to 30 hides; it is best adapted for sole-leather and other so-called heavy goods. The leather is fully as durable as that tanned with oak-bark, and nearly as good in color. Bark, carefully stored for a season, improves in tanning power considerably. From experiments made under the author's direction it appears, that no appreciable difference exists in the percentage of tannin in Wattle-bark, whether obtained in the dry or in the wet season. The tannin of this Acacia yields a gray precipitate with ferric and a violet color with ferrous salts; it is completely precipitated from a strong aqueous solution by means of concentrated sulphuric acid. The bark improves by age and dessication, and yields about 40 per cent. of catechu, rather more than half of which is tannic acid. Bichromate of potash, added in a minute quantity to the boiling solution of mimosa-tannin, produces a ruby-red liquid, fit for dye-purposes; and this solution gives with the salt of sub-oxide of iron black pigments, and with the salts of the full oxide of iron red-brown dyes [F. v. M. and Rummel]. As far back as 1823 a fluid extract of Wattle-bark was shipped to London, fetching then an extraordinary price, 1 ton of bark yielding 4 cwt. of extract of tar-consistence [Simmonds], thus saving much freight and cartage.

Tan-extract is best obtained from the bark by hydraulic pressure and evaporation of the strong liquid thus obtained in wide pans under steam-heat, or better still, to avoid any decomposition of the tannic acid, by evaporation under a strong current of cold air. For cutch or terra japonica the infusion is carefully evaporated by gentle heat. The estimation of tannic acid in Acacia-barks is effected most expeditiously by filtering the aqueous decoction of the bark after cooling, evaporating the solution and then re-dissolving the residue in alcohol and determining the weight of the tannic principle obtained by evaporating the filtered alcohol-solution to perfect dryness.

The cultivation of the Tan-Wattle is extremely easy, being effected by sowing either broadcast or in rows. In Australia particularly it is capable of immense extension, often on otherwise unutilized ground, and within the grasp of the crudest of labor. Tanners in colder countries might acquire in the nearest warmer regions poor inexpensive land, to provide an independent supply of this valuable bark from comparatively near shipping places. Seeds can be obtained in Melbourne at about 5s. per lb., which contains from 30,000 to 50,000 grains; they are known to retain their vitality for several years. For discrimination in mercantile transactions it may be noted, that the seeds of A. mollissima are somewhat smaller, comparatively shorter, rounder and not so flat as those of A. dealbata, while the funicular appendage does not extend so far along the seeds, nor is the pod quite so broad; from those of A. pycnantha they differ in being shorter, thus more ovate than elliptical. Much of what is said in this article applies as well to A. mollissima. See in reference to this and kindred subjects also J. H. Maiden's "The useful native plants of Australia."

Seeds should be soaked in warm water before sowing. Any bare, sterile, unutilized place might most remuneratively be sown with this Wattle-Acacia; the return could be expected in from five to ten years. Full-grown trees, which supply also the best quality, yield as much as 1 cwt. of bark. The rate of growth of the tree is about 1 inch in diameter of stem annually. It is content with the poorest and driest soil, although in more fertile ground it shows greater celerity of growth. Bark from trees, grown on very calcareous soil, is less strong in tan. This Acacia is perhaps the most important of all tan-yielding trees of the warm temperate zones, for its strength in tannic acid, its rapidity of growth, its contentedness with almost any soil, the ease with which it can be reared and its early yield of tanner's bark, and indeed also gum and stave-wood. This tree is to be recommended for poor land, affected with sorrel. It is hardier than Eucalyptus globulus, thus enduring the climate of South-England, although unlike A. dealbata it hardly extends to sub-alpine elevations. Pasture-animals browse on the foliage. See also notes under A. mollissima.

Acacia erubescens, Welwitsch.

Western Tropical Africa. A small tree only, but affording the best gum in Angola and the nearest regions [Dr. Welwitsch]. Tropical Acacias have proved hardy in the mild extra-tropic zone, thus also this species might merit introduction elsewhere. Another Acacia of Western Africa, the "Ahna," particularly occurring in Damaras, bears a profusion of reddish pods, which form a nutritious food, not only for pasture-animals, but even for the nomadic natives. The Ahna occasionally attains a height of 100 feet and a stem-circumference of 30 feet. The bark yields strong tan [T. Christy].

Acacia estrophiolata, F. v. Mueller.

Central Australia. A tree, attaining a height of 30 feet and a stem-diameter of 1 foot, enduring the extremest of dry heat; suitable for cemeteries on account of its pendent branches. It flowers almost constantly, and accommodates itself to all sorts of soil, even sand. Wood very durable, locally much used for implements and especially wheelwright's works [Rev. H. Kempe]. Bark rich in tannin.

Acacia excelsa, Bentham.

The Ironbark-Acacia of Queensland, extending into New South Wales. Attains a height of 80 feet. Branches pendent. The wood is dark-colored hard, heavy and durable, well adapted for furniture and implements; towards the centre it is of a deep pinkish color. The tree exudes a large quantity of clear gum [O'Shanesy], and sprouts again from the root after the stem is cut. Also particularly eligible for cemeteries.

Acacia falcata, Willdenow.

Extra-tropical East-Australia. A small tree. Important for its bark in tanneries.

Acacia Farnesiana, Willdenow.

Indigenous to Southern Asia; found eastward as far as Japan; a native also of the warmer parts of Australia, as far south as the Darling-River; found spontaneous in tropical and sub-tropical America, but apparently not in tropical Africa. The scented flowers, inappropriately called "cassie" flowers, are much sought for perfumery, and develop successively. This species may well be utilized as a hedge-plant; a kind of gum arabic may also be obtained from it. The scent perhaps obtainable from the fresh and slightly moist flowers by gentle dry distillation under mere steam-heat. Ordinarily the odorous essential oil is withdrawn from the flowers by the enfleurage-process; many Australian Acacias might be thus treated for perfumery.

Acacia fasciculifera, F. v. Mueller.

South-Queensland. Tree, sometimes to 70 feet high; branches pendent. Desirable for culture on account of the excellence of its easily worked dark wood. Eligible also for cemeteries.

Acacia giraffae, Willdenow.

South-Africa. The Camel-Thorn. This tree attains a great age and a height of 40 feet. The trunk assumes a large size, and supplies a wood of great hardness. The tree will grow on the driest soil and in the hottest clime. It produces a portion of the Cape-Gum.

Acacia glaucescens, Willdenow.

Queensland and New South Wales. Extreme height about 60 feet. A kind of "Myall," with hard, dark, prettily grained wood, which is however less fragrant than that of some other species.

Acacia Greggii, Asa Gray.

From Southern California to Arizona and Texas. A small tree, allied to A. Wrightii (Bentham) of the Rio Grande-region. A kind of lac is copiously obtained from this tree in the Mojave- and Colorado-Deserts [Prof. Stilman]. This plant lives at a rainfall of 3 inches a year.

Acacia gummifera, Willdenow.

This tree yields principally the Gum Arabic of Morocco [Sir Joseph Hooker and John Ball]. The principal collecting time extends over six weeks in midsummer.

Acacia harpophylla, F. v. Mueller.

Southern Queensland. A tree, sometimes attaining a height of 90 feet, furnishing locally a considerable share of the mercantile wattle-bark for tanning purposes, particularly for light leather. Wood, according to Mr. P. O'Shanesy, brown, hard, heavy and elastic, somewhat of violet odor; it splits freely and is thus also well adapted for fancy lathe-work; used by the natives for spears. The tree grows naturally on sand-lands, almost to the exclusion of other trees and shrubs. Saplings, used as stakes in vineyards, have lasted 20 years and more. The tree yields also considerable quantities of gum. It is one of the principal "Brigalows" in the scrubs of that designation.

Acacia heteroclita, Meissner.

South-Western Australia. This or an allied species furnishes a particular sort of edible gum, called by the autochthones "Quannot" [Hon. John Forrest].

Acacia homalophylla, Cunningham.

The principal "Myall," extending from the desert of South-Australia into New South Wales. Never a tall tree. The dark-brown wood is much sought for turners' work on account of its solidity and fragrance; perhaps its most extensive use is in the manufacture of tobacco-pipes. Allied species pass under the aboriginal appellation "Boree." Some or most will grow in the bleakest and most arid localities, wherever frost is not severe.

Acacia horrida, Willdenow.

The "Doornboom" or "Karra-Doorn" of South-Africa. A formidable hedge-bush with thorns often 3 inches long, readily available for impenetrable hedge-rows. It exudes also a gum of good

quality, but often of amber-color. This is the principal species used for tanners' bark in South-Africa, where Leucospermum conocarpum (R. Br.) is also extensively employed for the same purpose [McGibbon], though it imparts an unpleasant odor to the leather made with it [McOwan].

Acacia implexa, Bentham.

Victoria, New South Wales, Queensland. A tree of middle size, content with poor soil. Wood firm and close, dark-brown with yellowish stripes; much in demand for turnery, cogwheels and other purposes, which need tenacity and strength [Dickinson]. Bark available for tanneries.

Acacia Koa, A. Gray.

Hawaii; there one of the most valuable of timber-trees. Stem reaching a height of 60 feet, topped by wide-spreading phyllodinous foliage. Wood easy to work, particularly in a fresh state; formerly much-used for boat-building and for building purposes generally; also suitable for cabinet-work. Species of Metrosideros, some ascending to 8,000 feet, one over-topping all other trees, furnish a large share of hard, tough and very durable timber in the Hawaian islands. Their wood varies from a light red to a purplish hue [Hon. Judge McCully].

Acacia leiophylla, Bentham.* (*A. saligna,* Bentham not Wendland.)

South-Western Australia, where it is the principal tree chosen for tanners' bark. It is a wide-spreading small tree, fit for avenues; emitting suckers. The weeping habit fits it particularly also for cemeteries. It comes into flower simultaneously with the Cherry-tree, or somewhat later, and blooms profusely. The bark contains nearly 30 per cent. of mimosa-tannin, and is extensively used by tanners in West-Australia. Perfectly dried leaves yield from 7 to 8 per cent. mimosa-tannic acid, giving a lead-precipitate of a light yellow-color; the leaves contain also a considerable quantity of sulphate of lime. The London price of fair West-Australian gum from this species was from 46s. to 49s. per cwt. in 1879. The tree has proved in Algeria to resist the sirocco better than most species [Dr. Bonand]. A. cyanophylla (Lindley) is a closely allied species, serving the same purposes.

Acacia longifolia, Willdenow.

South-Eastern Australia. This tree is introduced into this list, inasmuch as the very bushy variety, known as A. Sophoræ (R. Brown), renders most important service in subduing loose coast-sand, the lower branches striking root into the soil; it should therefore be disseminated on extensively bare sand-shores in regions, where no severe frosts occur. The bark of A. longifolia is only half as good as that of A. mollissima for tan, and used chiefly for sheep-skins. The tree is of quick growth.

Acacia macrantha, Bentham.

From Mexico to Argentina, also in the Galapagos-Group. This tree, usually small, provides the "Cuji-pods" for tanning [Simmonds].

Acacia Melanoxylon, R. Brown.*

South-Eastern Australia. Ascends to subalpine country. Generally known as Blackwood-tree, passing also under the inappropriate name of Lightwood-tree. In irrigated glens of deep soil the tree will attain a height of 80 feet, with a stem several feet in diameter. The wood is most valuable for furniture, railroad-cars and carriages, boat building (stem and stern-post, ribs, rudder), for tool-handles, crutches, stethescopes, some portions of the work of organ-builders, billiard-tables, pianofortes (for sound-boards and actions) and numerous other purposes; it has also come into use for casks, which need however previous long soaking. Planks 12 feet by 4 feet are occasionally obtainable for select purposes. Specific gravity of the dry wood 0.664-0.777. Mr. Speight reports it for railway-carriages better adapted than almost any other timber, and far less costly; wood from hilly country is also in this instance superior to that from low and particularly wet localities. The fine-grained wood is cut into veneers; it takes a fine polish, and is considered almost equal to walnut. The best wood in Victoria for bending under steam; it does not warp and twist. Local experiments gave the strength in transverse strain of Blackwood equal to Eucalyptus-wood of middling strength, approaching that of the American White Oak, and surpassing that of the Kauri. The bark contains up to 20 per cent. mimosa-tannin. The tree has proved, with A. mollissima and A. dealbata, hardy in the Isle of Arran [Rev. D. Landsborough].

Acacia microbotrya, Bentham.

South-Western Australia. The "Badjong." A comparatively tall species, the stem attaining a diameter of 1 to $1\frac{1}{2}$ feet. It prefers river-valleys, and lines brooks naturally. According to Mr. Geo. Whitfield, a single tree may yield 50 lbs. of gum in a season. The aborigines store the gum in hollow trees for winter use; it is of a pleasant, sweetish taste.

Acacia mollissima, Willdenow.*

South-Eastern Australia, extending to Tasmania. Black Wattle. It seems best, to re-adopt the systematic names, by which our three principal feather-leaved wattles were distinguished during the first half of the century. Not so tall, nor quite as hardy as A. dealbata. The price of Wattle-bark in London has occasionally risen to £17. For tan-bark A. mollissima is the best. Mr. Dickinson states that he has seen 10 cwt. of fresh bark obtained from a single tree of gigantic dimensions at Southport. A quarter of a ton of bark

was got from one tree at Tambo, without stripping all the branches. The height of this tree was 60 feet, and the stem 2 feet in diameter. Tasmania exports about £40,000 worth of Wattle-bark annually. Messrs. Borrow and Haycroft, in South-Australia, are now producing a thick fluid extract from Wattle-bark and twigs by steam-machinery, the average percentage of mimosa-tannic acid in this extract being 38.20. By cutting off branches in Wattle-plantations the needful thinning out is obtained. Catechu can be realized from the thick tan-liquid by mere exsiccation. In 1880, the United Kingdom paid, according to Mr. P. L. Simmonds, three million pounds for tan-barks, and one and a quarter million for other tan-substances. The wood of this Acacia, particularly when the trees are in an unhealthy state, is sometimes bored by the large larva of a moth, namely that of Eudoxyla Eucalypti, also by beetles of the genus Phoracantha [C. French].

For fuller information the "Report on Wattle-bark," presented in 1878 to the Parliament of Victoria by a special commission, may be referred to.

Acacia moniliformis, Grisebach.

Argentina. The "Tusca." The young pods are used for feeding horses and cattle [Dr. Lorentz], like those of Acacia Cavenia in South-Western America.

Acacia Nilotica, Delile.

Arabia, Egypt and Nubia. Closely allied to A. Arabica. Wood very hard. The growth of the tree is comparatively quick; it succeeds also on sandy and brackish ground [Dr. Schweinfurth].

Acacia Osswaldi, F. v. Mueller.

Widely distributed through the desert-country of Australia. Pasture-animals browse on the foliage [Rev. J. M. Curran].

Acacia pendula, Cunningham.

New South Wales and Queensland, generally in marshy tracts of the interior. The "Boree" or "Weeping Myall." Reaching 35 feet in height. Wood violet-scented, hard, close-grained, beautifully marked; used by cabinet-makers and turners, in high repute for tobacco-pipes [W. Hill]. The tree is desirable for cemeteries.

Acacia penninervis, Sieber.

Victoria, New South Wales and Queensland. A small tree, so hardy as to occupy sub-alpine localities. The bark contains about 18 per cent. of tannin. Mr. A. R. Crawford found the bark of singular tanning strength, and producing a soft and pale leather.

Acacia Peuce, F. v. Mueller.

Central Australia. Wood one of the hardest and heaviest in existence; dark-colored. Specific gravity 1.369-1.375 [Blackett].

Acacia polybotrya, Bentham.

New South Wales and Queensland. Attains a height of 40 feet and yields, according to Mr. O'Shanesy, a good tan-bark.

Acacia pycnantha, Bentham.*

Victoria and South-Australia. The "Golden Wattle" of the colonists. This tree, which attains a maximum height of about 30 feet, is second only to A. mollissima in importance for its yield of tanners' bark; the quality of the latter is even sometimes superior to that of the Black Wattle, but the yield is less, as the tree is smaller and the bark thinner. It is a tree of rapid growth, content with almost any soil, but is generally found in poor sandy ground, particularly near the sea-coast, where A. decurrens would not succeed, and thus also important for binding rolling sand. It does not bear severe frost. Experiments, instituted by me, have proved the absolutely dried bark to contain up to 30 per cent. tanning principle, full-grown sound trees supplying the best quality. The aqueous infusion of the bark can be reduced by boiling to a dry extract, which in medicinal and other respects is equal to the best Indian catechu, as derived from Acacia Catechu and A. Suma; it yields nearly 30 per cent., about half of which or more is mimosa-tannic-acid. This catechu is also of great use for preserving against decay articles subject to exposure in water, such as ropes, nets and fishing-lines. The fresh leaves yield up to 6 per cent. and dry leaves up to 15 or 16 per cent. of mimosa-tannin. Mr. Goyder found the percentage of mimosa-tannin in the stem-bark, estimated by Loewenthal's method, to vary from about 12 to 22 per cent. While, according to Mr. Simmonds, the import of the bark of oaks and hemlock-spruce into England becomes every year less, and while the import of sumach and gambir does not increase, the annual demand for tanning substances has within the last twenty years been doubled. The import of tan-bark from South-Australia into Britain during 1886 was 71,141 cwt., valued at £51,632. A. pycnantha is also important for its copious yield of gum, which is in some localities advantageously collected for home-consumption and also for export. The wood, though not of large dimensions, is well adapted for staves, handles of various implements and articles of turnery, especially bobbins [Dickinson]. It is pale and can be easily worked. By improved methods, the fragrant oil of the flowers could doubtless be fixed, though its absolute isolation might be difficult and unremunerative. The tree as a rule seeds well. An acre planted with this tree yielded five tons of bark in the seventh year, worth £8 a ton here.

Acacia retinodes, Schlechtendal.

South-Eastern Australia. Ascertained so early as 1846 by Dr. Hermann Behr to yield a good tanners' bark and much gum. This Acacia is ever-flowering, and in this respect almost exceptional. In the South of England it needs only wall-protection [Bateman].

It likes river-banks, but never grows beyond the height of a small tree. A. neriifolia (A. Cunningham) of New South Wales is a closely allied species.

Acacia Sentis, F. v. Mueller.

Interior of Australia. This shrub or small tree is suitable for hedges. The seeds of this species and also of A. Kempeana, A. cibaria and some others are eaten by the natives. Horses, cattle, sheep and goats browse in Central Australia with avidity on the foliage [Rev. H. Kempe]. This species will endure most protracted drought and a shade-temperature of 118° F. The foliage of this and of A. aneura and A. salicina proved a favorite food of dromedaries [Sir Thomas Elder]. Its gum is similar to the least-colored kinds of gum arabic.

Acacia Seyal, Delile.

In the Libyan and Nubian Deserts. This thorny tree exudes a brownish kind of gum arabic. It is adapted for the most arid desert-country. In any oasis it forms a large and shady tree. Native name "Soffar." Can be utilized for thorny hedges as well as A. tortilis (Forskael), the latter also yielding gum arabic.

Acacia stenocarpa, Hochstetter.

Abyssinia and Nubia. A large tree, which yields the brownish "Suak-" or "Talha" -Gum, a kind of gum arabic [Hanbury and Flueckiger].

Acacia stenophylla, Cunningham.

On banks of water-courses in the interior of Australia, as far south as the Murray-River. A tree with exquisite, hard, dark wood, which serves the purposes as Myall-wood; locally known as Iron-wood. Attains a height of 60 feet and a stem-diameter of 2 feet.

Acacia subporosa, F. v. Mueller.

South-Eastern Australia. Straight stems over 50 feet long are formed by this tree; the wood is tough and elastic, fit for carriage-shafts, gunstocks, various select tools [L. Morton].

Acacia Verek, Guillemin and Perrottet.

From Senegambia to Nubia. Affords the best white gum arabic of the Nile-region, and a large quantity of this on a commercial scale. A. Etbaica (Schweinfurth) from the same region produces also a good mercantile gum.

Acanthophœnix rubra, H. Wendland.

Mauritius and Réunion. This palm has proved hardy in Florida, also as far south as Sydney [C. Moore]. Height reaching 60 feet. The upper rings of the stem are of a bright red. In gardens usually passing as an Areca.

Acanthosicyos horrida, Welwitsch.

The "Narras." In the deserts of Angola, Benguela and Damaras. This thorny, erect, cucurbitaceous shrub thrives even in absolute coast-sand, and would likely prove valuable for sandy desert-country. The tribes of Hottentots near Walfish-Bay mainly subsist, as regards vegetable food, on the Narras for some time in the year. It bears fruit of the size and color of oranges, and of pleasant acidulous and sweetish taste. The seeds are also edible, remarkably oily and of hazel-taste [R. Marlott]; they also serve as lab. The Missionary Duparquet counted exceptionally as many as 200 fruits on one plant [Prof. Naudin]. No rain occurs in the Acanthosicyos- and Welwitschia-region, but the mean heat does not exceed 70° F., and the soil is kept somewhat moist through capillarity from beneath.

Acer Campbellii, J. Hooker and Thomson.

The chief Maple of the North-Eastern Himalayas. A large tree. Freely reproduced by seed or coppice. Wood pale, close-grained, particularly valuable for planking [Gamble].

Acer campestre, Linné.

The British Maple. Extends from South- and Middle-Europe to Northern Africa, also to many parts of Asia. Height reaching 40 feet, in shelter and deep soil; the yellow and purple tints of its foliage in autumn render the tree then particularly beautiful. Occurs in Norway to 63° 26′ N. L. [Prof. Schuebeler]. The wood is compact and fine-grained, and sought for choice furniture, machinery and musical instruments. The tree can be trimmed into hedges. Comparatively quick in growth, and easily raised from seed. These remarks apply to many kinds of maples.

Acer circinatum, Pursh.

The Vine-Maple of North-Western America, forming in some parts of Oregon impenetrable forests on account of its long branches bending to the ground and striking root; its autumnal tint gives quite a picture to the landscape. The stem is sometimes 40 feet long, but slender. Found to be hardy as far north as Christiania or even Nyborg, in lat. 70° 10′, where the mean annual temperature is 29° F., the highest 95° and the lowest −40° F. [Professor Schuebeler]. The wood is heavier and of closer grain than that of A. macrophyllum [Dr. Gibbons]; very tough, used for helves and many implements [Dr. G. Dawson].

Acer dasycarpum, Ehrhart. (*A. saccharinum,* Linné.)

The Silver-Maple of North-America. Requires a rather warmer climate than most other American maples, but has proved hardy in Norway as far as 59° 55′ N. [Schuebeler]. Height reaching 50 feet; stem sometimes 9 feet in diameter. Much praised for street-planting; growth comparatively rapid. It produces no suckers, nor is the tree subject to disease. A most beautiful tree, with a stout stem and a magnificent crown, growing best on the banks of rivers with limpid water and a gravelly bed, but never in swampy ground, where the Red Maple takes its place. Excellent trees can be raised from cuttings of this and some other congeners. The wood is pale and soft, of less strength and durability than that of many of its congeners, but makes excellent charcoal. It may be cut into extreme thinness for wood-paperhangings [Simmonds]. The tree also yields maple-sugar, though not in such quantity as A. nigrum. With other maples, an early yielder of honey to bees. The specific name, given by Linné, has priority, but does not apply to the best Sugar Maple.

Acer macrophyllum, Pursh.

Large Oregon-Maple. From British Columbia to Northern Mexico. A fine shade-tree of quick growth; sometimes reaching a height of 90 feet; stem attaining 16 feet in circumference; delights on banks of streams. The inner bark can be utilized for baskets, hats and superior mats; the hard and close wood is a substitute for hickory. It is whitish, beautifully streaked when curled. Splendid for ornamental work. Maple-sugar is also manufactured from the sap of this species [Sargent].

Acer Negundo, Linné. (*Negundo aceroides,* Moench.)

The Box-elder of North-America. Hardy in Norway to 59° 55′ N. [Schuebeler]. A tree, deciduous like the rest of the maples; may attain a height of about 50 feet; it is rich in saccharine sap; according to Vasey it contains almost as much as the Sugar-maple. In California it is used extensively as a shade-tree. Cultivated, the stem attains about 8 inches in diameter in 8 years [Brewer]. The wood is yellow, marked with violet and rosy streaks [Simmonds]. Rate of growth for stem-girth in Nebraska about 2 feet in fourteen years [Governor Furnas].

Acer nigrum, Michaux.* (*A. saccharinum,* Wangenheim.)

The Sugar- or Rock-Maple. Eastern North-America, extending to Arizona. One of the largest of the genus. It is the national emblem of Canada. In the cooler latitudes often 80 or rarely 120 feet high, with a stem 3 or 4 feet in diameter. Hardy to 59° 55′ N. in Norway [Schuebeler]. Likes a deeply friable soil and cool moist positions. The wood is strong, tough, hard, close-grained, of rosy tinge, and when well seasoned is used for axle-trees, spokes, shafts,

poles, furniture, exterior of pianos, saddle-trees, wheel-wrights' work, wooden dishes, founders' patterns and flooring; not apt to warp; preferred for shoe-lasts; when knotty or curly it furnishes the Bird's-eye and Curly Maple-wood. From the end of February till the early part of April the trees, when tapped, will yield the saccharine fluid, which is so extensively converted into Maple-sugar, each tree affording 12 to 24 gallons of sap in a season, 3 to 6 gallons giving 1lb. of sugar; but exceptionally the yield may rise to 100 and more gallons. The tapping process commences at the age of 20 years, and may be continued for 40 years or more without destruction of the tree [G. Maw]. According to Porcher, instances are on record of 33 lbs. of sugar having been obtained from a single tree in one season. The Sugar-Maple is rich in potash, furnishing a large proportion of this article in the United States. The bark is important for the manufacture of several American dyes. The tree is particularly recommendable in Australia for sub-alpine regions. It bears a massive head of foliage on a slender stem. The autumnal coloring is superb. In the Eastern States of North-America the Sugar-Maple is regarded as the best tree for shade-avenues. Numerous other maples exist, among which may be mentioned Acer Creticum (Linné) of South-Europe, 40 feet; A. lævigatum, A. sterculiaceum and A. villosum (Wallich) of Nepal, 40 feet.

Acer niveum, Blume.

Continental and Insular India, up on the forest-ranges. This is the tallest of the maples, attaining a height of 150 feet. Several other large maples, worthy of cultivation particularly in parks occur on the mountains of India, A. cæsium (Wallich) being one of the best.

Acer palmatum, Thunberg.

Japan. A beautiful tree, with deeply cleft leaves; several varieties, with red- and yellow-tinged leaves occur. Unhurt by frost at 0° F. [Gorlie]. Should it be an aim to bring together all the kinds of maples, which could be easily grown in appropriate spots, then Japan alone would furnish 22 species.

Acer pictum, Thunberg.

From Persia to Japan, ascending the Himalayas to 9,000 feet. Foliage turning yellow and red in autumn. Wood close-grained and elastic, particularly sought for load-poles, ploughs, chairs and various implements and utensils [Brandis]; twigs lopped off for fodder [Gamble]. A. oblongum (Wallich), A. Hookeri (Miquel) and other maples of Upper India furnish wood for the Assam tea-boxes [Sir Dietrich Brandis].

Acer platanoides, Linné.

The Norway-Maple, extending south to Switzerland. Up to 80 feet high. Found hardy in Norway (cultivated) to 60° 56′ N.; attains in 59° 46′ a stem-diameter of 3½ feet [Schuebeler]. The pale wood much used by cabinet-makers. Tint of the autumn-foliage golden-yellow. The tree is of imposing appearance, and much recommended for ornamental gardening; it gives a denser shade than most of the other maples. Placed by F. Deil as one of the very best among deciduous trees for street-planting in climes not too hot and dry. Sap of this species also saccharine.

Acer Pseudo-platanus, Linné.

The Sycamore-Maple or Spurious Plane. Middle and Southern Europe, Western Asia. Hardy to 67° 56′ N. in Norway [Schuebeler]. The celebrated maple at Trons, under which the Grisons swore the oath of union in 1424, exists still [Langethal]. Attains a height of over 100 feet. The wood is compact and firm, valuable for various implements, instruments and cabinet-work; thus mangles, presses, dishes, printing and bleaching works, beetling beams, and in foundries the patterns are often made of this wood [Simmonds]; for the back, neck, sides and circle of violins, for pianofortes (portion of the mechanism) and harps it is utilized, it being free-cutting and clean on the end grain. This like some other maples furnishes a superior charcoal for intense and continuous heat [Hartig]. Will admit of exposure to sea-air. The sap also saccharine.

Acer rubrum, Linné.

The Red-Maple of North-America. Hardy in Norway to 63° 26′ N. [Schuebeler]. A tree, attaining over 100 feet in height, 5 feet in stem-diameter. This species grows well with several other maples even in dry, open localities, although the foliage may somewhat suffer from hot winds, but thrives most luxuriantly in swampy, fertile soil. It is valued for street-planting. The foliage turns red in autumn, the flaming tints being indescribable [A. J. Cook]. The wood is of handsome appearance, used in considerable quantity for saddle-trees, yokes, turnery and various furniture; that of old trees is somewhat cross-grained; knotty it furnishes a portion of the curled Maple-wood, which is so beautiful and much in request for gun-stocks and inlaying. The tree yields also Maple-sugar, but like A. dasycarpum, only in about half the quantity obtained from A. nigrum [Porcher]. The flowers of some, if not all, maples are early frequented by bees for honey.

Achillea Millefolium, Linné.

Yarrow or Millfoil. Europe, Northern Asia and North-America. a perennial medicinal herb of considerable astringency, pervaded with essential oil, containing also a bitter principle (achillein) and

a peculiar acid, which takes its name from the generic appellation of the plant. It stimulates stagnant intestinal states, exercises beneficial catamenial forces, alleviates hæmorrhoidal sufferings, used to be a domestic remedy in ague, and is not without tonic value. Fitted for warrens and light sandy soil. Recommended by many for sheep-pastures, but disregarded by Langethal. Found indigenous in Norway as far as 71° 10′ N. [Schuebeler].

Achillea moschata, Wulfen.

Alps of Europe. The "Genipi" or "Iva" of the Swiss. This perennial herb ought to bear transferring to any other alpine mountains. With the allied A. nana (Linné) and A. atrata (Linné) it enters as a component into the aromatic medicinal Swiss tea. A. fragrantissima (Reichenbach) is a shrubby species from the deserts of Egypt, Turkey and Persia, valuable for its medicinal flowers.

Achras Sapota, Linné. (*Sapota Achras,* Miller.)

The "Sapodilla-Plum" of the West-Indies and Central America. A fine evergreen tree, producing delicious fruit. Needs regions free of frost. Yields also guttapercha. The bark possesses tonic properties. Achras Australis, R. Brown; (Sideroxylon Australe, J. Hooker), a tree yielding also tolerably good fruit, occurs in New South Wales and Queensland. Other sapotaceous trees, producing table-fruit, such as the Lucuma mammosa (the Marmalade-tree), Lucuma Bonplandi, Chrysophyllum Cainito (the Star-Apple), all from West India, and Lucuma Cainito of Peru, might also be subjected to trial-culture in sub-tropical forest-valleys; so furthermore many of the trees of this order, from which guttapercha is obtained (species of Palaquium, Isonandra, Sideroxylon, Cacosmanthus, Illippe, Mimusops, Imbricaria and Payenia), might prove hardy in sheltered woodlands, as they seem to need rather an equable humid and mild climate, than the heat of the torrid zone.

Aciphylla glacialis, F. v. Mueller.

Australian Alps. The root of this perennial herb is somewhat aromatic, and is liked by pasture animals. It may prove of culinary value.

Aconitum Napellus, Linné.

The "Monk's Hood." In the colder parts of Europe and Asia, extending to the Himalayas and also to arctic America, especially in mountainous regions. A powerful medicinal plant of perennial growth, but sometimes only of biennial duration, variable in its forms. It was first introduced into Australia, together with a number of other Aconites, by the writer. All the species possess more or less modified medicinal qualities, as well in their herbage as in their roots; but so dangerously powerful are they, that the plants should never be administered except as prescribed by a

qualified physician. Napellus-root contains three alkaloids: aconitin, napellin and narcotin. The foliage contains also a highly acrid volatile principle, perhaps chemically not unlike that of many other Ranunculaceæ. Aconitin, one of the most potent poisons in existence, can likewise be obtained from the highly powerful Nepalese and Himalayan Aconitum ferox (Wallich) and probably from several other species of the genus. Aconite decreases pulsation, cardial force, respiration, febrile heat and neural sensibility; it increases renal action and induces perspiration; but it must be administered under the precaution, that bodily strength is sufficient to overcome the depressing effect of this remedy. It can thus be utilized in many and very varied diseases.

Acorus Calamus, Linné.

The "Sweet Flag." Europe, Middle and Northern Asia, North-America. In Norway indigenous to 61° N., cultivated up to 63° 26' [Schuebeler]. A perennial pond- or marsh-plant. The aromatic root is used as a stomachic and also in the preparation of confectionery, in the distillation of gin and liqueurs, and in the brewing of some kinds of beer. The flavor of the root depends mainly on a peculiar volatile oil. It is used also as antiseptic for mastication, forms a good ingredient to tooth-powder, and is therapeutically regarded as a stimulant of the nerves.

Acrocomia Mexicana, Karwinski.

Mexico, in the cooler regions up to 3,000 feet, with a mean-temperature of 65° F. [Drude]. A prickly palm, reaching 20 feet in height, accompanied by very splendid Chamædora-Palms in the shade of oak-forests.

Acrocomia Totai, Martius.

Argentina. Attains a height of 50 feet. The fruits are sweet and wholesome.

Actæa spicata, Linné.

The "Baneberry." On wooded mountains, mainly on limestone-soil in Europe, Northern Asia and North-America. A perennial medicinal herb. Its virtue depends on peculiar acrid and bitter as well as other principles. In North-America the roots of this species and of A. alba (Bigelow) are further praised as efficacious antidotes against ophidian poisons. They have emetic properties and resemble also in other medicinal respects the root of Helleborus.

Actinidia arguta, Planchon.

Japan. This climber is praised by L. Boehmer for its gooseberry-like fruits of fig-taste, but only consumable after frost.

Adansonia digitata, Linné.

Warm and hot regions of Africa, fully to 23° South. Quite hardy down to the tropic of Capricorn in East-Australia [Edgar]. The Boabab or Monkey-bread tree. One of the most colossal trees of the globe as regards stem-diameter, which reaches sometimes 30 feet, while the branches may spread out to 150 feet. The soon drying pulp of the fruit is of pleasant acid taste. A similar species is A. Gregorii (F. v. M.) from North-Western Australia.

Adenostemum nitidum, Persoon.

Southern Chili, where this stately tree passes by the appellations "Queule, Nuble and Aracua." Wood durable and beautifully streaked. Fruit edible.

Adesmia balsamica, Bertero.

The "Jarilla" of Chili. A small shrub remarkable for exuding a fragrant balsam of some technic value [Philippi].

Aegle marmelos, Correa.

The Bael-Tree of India, ascending to 4,000 feet. Finally 40 feet high. Fruit of medicinal, particularly antidysenteric value.

Aegle sepiaria, De Candolle. (*Citrus trifoliata,* Linné.)

Japan. Much grown as a hedge-shrub in its native country and in China; also reared as stock for grafting on it the orange-plant.

Aegiceras majus, Gaertner.

Southern Asia, Polynesia, Northern and Eastern Australia. This spurious Mangrove-tree extends far south into New South Wales. It may be employed for preventing the washing away of mud by the tide, and for thus consolidating shores subject to inundation by sea-floods.

Aeschynomene aspera, Linné.

The "Solah" of tropical Asia and Africa. A large perennial erect or floating swamp-plant. Introduced from the Botanic Gardens of Melbourne early into the tropical parts of Australia. Pith-hats are made from the young stems of this plant; this pith is also a substitute for cork in some of its uses. The Solah is of less importance for cultivation than for naturalisation. Mr. Strachan, of Melbourne, makes of the pith life-waistcoats, weighing only 1½ lb., as a safeguard against drowning.

Aesculus Californica, Nuttall.

California. This beautiful tree attains a height of 50 feet, with a stem 6 feet in diameter, the foliage spreading out exceptionally over a width of 60 feet, the extremities of the branches touching

the ground. In full bloom it is a magnificent ornament, with its crowded snow-white flowers, visible for a long distance. The wood is light and porous, and used for the yokes of oxen and for various other implements [Dr. Gibbons].

Æsculus Hippocastanum, Linné.

The "Horse-Chestnut-Tree." Indigenous to North-Greece, Thessaly and Epirus, on high ranges [Heldreich], where it is associated with the Walnut, several Oaks and Pines, at an altitude of 3-4,000 feet, occurring likewise in Imeretia, the Caucasus [Eichwald], and possibly wild also in Central Asia, reared on the Himalayas to 10,000 feet. One of the most showy of deciduous trees, more particularly when during spring "it has reached the meridian of its glory, and stands forth in all the gorgeousness of leaves and blossoms." Height reaching 60 feet, circumference of stem sometimes 16 feet. In cool climates one of the choicest of trees for street-planting. Flowers sought by bees in preference to those of any other northern tree except the Linden. Even in Norway, in latitude 67° 56′ N., a cultivated tree attained a height of 60 feet and a stem-circumference of 11 feet [Schuebeler]. It will succeed even in sandy soil, but likes sheltered spots. The wood adapted for furniture, also particularly for mould patterns in casting, the slips of pianofortes and a variety of other purposes; it remains free from insects. The fruits afford saponin. The seeds yield starch copiously, and supply also food for various domestic animals; the bark serves as a good tanning material. A variety is known with thornless fruits. Three species occur in Japan and several in North-America and South-Asia, mostly not of great height.

Æsculus Indica, Colebrooke.

In the Himalayas, from 3,500 to 9,000 feet. Height finally 70 feet; trunk comparatively short, occasionally with a girth of 25 feet. Never quite without leaves. Can be used like the Horse-Chestnut as an ornamental shade-tree. Twigs lopped off for fodder in India. Wood whitish, soft, available for various purposes, particularly liked for water-troughs, drinking-vessels, platters [Gamble]. Other Asiatic species are A. Punduana (Wallich), A. Chinensis (Bunge), A. dissimilis (Blume).

Æsculus lutea, Wangenhein. (*A. flava,* Aiton).

The "Buck-eye." North-America. This showy tree rises occasionally to a height of 80 feet. The wood is light, soft and porous, not inclined to split or crack in drying. It is valuable for troughs, bread-trays, wooden bowls and shuttles [Simmonds], also for ceiling and wainscoting [Mohr].

Æsculus turbinata, Blume.

Japan. The "Tochnoki." Height to 40 feet. Valuable as a promenade-tree for shade, some planted at Japanese pagodas spreading to extraordinary width [Dr. Méne]. The seeds are there used for human food. The hardy Chinese A. Sinensis is very closely allied to this, and flowers later than A. Hippocastanum [Dr. Masters].

Agaricus cæsareus, Schaeffer.

In the spruce-forests of Middle and Southern Europe. Trials might be made to naturalise this long-famed and highly delicious mushroom in our woodlands. It attains a width of nearly one foot, and is of a magnificent orange-color. Numerous other edible Agarics could doubtless be brought into this country by the mere dispersion of the spores in fit localities. As large or otherwise specially eligible may here be mentioned, on the authority of Dr. Rosenthal, who alludes to many more, A. extinctorius L., A. melleus Vahl, A. deliciosus L., A. giganteus Sowerby, A. Cardarella Fr., A. Marzuolus Fr., A. Eryngii Cand., A. splendens Pers., A. odorus Bulliard, A. auricula Cand., A. oreades Bolt., A. esculentus Wulf., A., mouceron Tratt., A. socialis Cand., A. laccatus Scop., all from Europe, besides numerous other highly valuable species from other parts of the globe. Professor Goeppert adds as edible species, sold in Silesia and other parts of Germany: A. decorosus Fries, A. fusipes Bull., A. gambosus Fries, A. procerus Scop., A. scorodonius Fries, A. silvaticus Schaeff., A. virgineus Wulf., A. volemus Fries, besides the almost cosmopolitan A. campestris Linné and A. arvensis Schaeffer. Dr. M. C. Cooke mentions of Agarics besides as European (mostly British) kinds, fit for the kitchen: A. rachodes Vitt., A. personatus Fr., A. nebularis Batsch, A. dealbatus, Sow., A. geotropus Bull., A. salignus Tratt., A. prunulus Scop., A. mutabilis Schaeff., A. squarrosus O. Muell., A. pudicus Viv. Dr. L. Planchon noted the following among the French edible species additionally: A. vaginatus Bull., A. ovoideus Bull., A. rubescens Fr., A. caligatus Viv., A. terreus Schaeff., A. albellus Cand., A. nudus Bull., A. crassipes Desm., A. piperatus L., A. cylindrius Cand., A. pluteus Fr., A. bombycinus Schaeff. Dr. Goeze speaks particularly of A. palometus, Thore and A. graveolens, Pers. Several of these extend spontaneously to Australia. Mushroom beds are best made from horse-manure, mixed with one-eighth loam, the scattering of the mushroom-fragments to be effected, when the temperature of the hot-bed has become reduced to 85° F., this sowing to be made 2-3 inches deep, and 4 inches apart; 1 inch sifted loam over the damp bed and some hay to cover the whole. After two months mushrooms can be gathered from the bed. Mushroom-beds can also be prepared in spare places of cellars, stables, sheds and other spots, where equability of mild temperature and some humidity can be secured. According to Mr. C. F. Heinemann, of Erfurt, the needful hot-beds can best be made one above another,

inclined forward, generating a temperature of from 60° to 90° F., a surface-layer of cut straw being applied subsequently, to be removed after about two weeks, then to be replaced by a stratum of rich loam as a matrix for the root-like organs of the pushing fungs. In Japan mushrooms are reared on decayed split logs, and largely consumed. In France mushrooms are grown in caves to an enormous extent. Puff-balls when young are also edible, and some of them delicious [Meehan]. A. Georgii (Fries) is the only mushroom utilized by the Kaffirs for food [Professor MacOwan]. The Chinese dry A. campestris in vast quantities even for export. About Paris are about 300 establishments for the rearing of this, the most generally used of kitchen-fungs. Probably the most extensive of all rearing-places of the common champignon is that of Alex. Hatschek, of Linz, in deserted underground quarries, where the production is at a gigantic and highly remunerative scale [Dr. E. Goeze].

Agaricus flammeus, Scopoli.

Europe, Asia. In Cashmere particularly noticed as a large and excellent edible mushroom [Dr. Atchison]. Some of the noxious mushrooms become edible by drying. Professor Morren mentions among edible Belgian species Agaricus laccatus Scop., Russula integra Fr. Any kind of cavern might be turned into a mushroom field ; the spawn is spread on fermented manure, and kept moist by water to which some saltpetre is added. They all afford a highly nutritious nitrogenous food, but some require particular cooking. See also the agaric-like mushrooms noticed under Cantharellus, Coprinus, Cortinarius, Russula.

Agaricus ostreatus, Jacquin.

On trunks chiefly of deciduous trees throughout Europe. The delicious oyster-mushroom, renowned from antiquity, hence prominently on this occasion mentioned. For fuller information on fungs for the table consult as very accessible works Badhams's "Esculent Funguses of England," and Cooke's "British Fungi"; for systematic characteristics see the works of Fries, Berkeley, Cooke, Saccardo and others.

Agave Americana, Linné.

One of the gigantic Aloes of Central America, hardy even in mild places of South-England. In the open air it comes into flower in about ten years or later. The flowering stem may shoot up to the extent of ten feet in a week, and may finally rise to 40 feet. Mr. Fred. Hickox at Clunes saw the young offshoots producing also small flower-bunches, while the maternal plant was in bloom. The pithy stem can be utilized for some of the purposes, for which cork is usually employed—for instance, to form the bottoms of insect-cases. The honey-sucking birds and bees are very fond of the

flowers of this prodigious plant. The leaves of this and some other Agaves, such as A. Mexicana, furnish the strong Pita-fibre, which is adapted for ropes and even for beautiful textile fabrics. The strength of ropes of this fibre is considerably greater than that of hemp-ropes; they are durable as well in as out of water. The leaves contain saponin. The mellaginous sap, which on incision flows from the young flower-stem, can be converted into an alcoholic liquid, and thus the "Pulque" beverage is prepared. Where space and circumstances admit of it, impenetrable hedges may be raised in the course of some years from Agaves. One kind rose in Fiji also to 38 feet [Thurston]. The infusion of the leaves can be applied as an insecticide.

Agave heteracantha, Zuccarini.

Northern Mexico and Texas. The Ixtli-fibre, now extensively used for brushes, is much derived from this species. From Tampico alone have lately been shipped about 35,000 tons of this fibre annually. The average length is 24 inches [Consul Cassard]. The fibre is also worked into ropes and mats [Dr. C. Mohr].

Agave inaequidens, K. Koch.

Mexico. Closely allied to A. Americana; it seems to include A. Hookeri and A. Fenzliana, Jacobi, according to Baker (in Bot. Mag. 6589 and Gardeners' Chronicle 1871 p. 718). All these serve also grandly as scenic plants.

Agave rigida, Miller.*

Southern Mexico. The Chelem, Henequen and Sacci, furnishing the Sisal-hemp. Drs. Perrine, Scott and Engelmann indicate several varieties of this stately plant, the fibre being therefore also variable, both in quantity and quality. The leaves of the Sacci or Sacqui give the largest return. The yield of fibre begins in four or five years, and lasts for half a century or more, the plant being prevented from flowering by cutting away its flower-stalk when very young. The produce is from 1,000lbs. to 1,200lbs. clear fibre per acre, worth £30 to £50 per ton. In the Bahamas 150,000 acres were lately granted by the governor for Sisal-culture. The fibre is straight, glossy and strong, particularly well adapted for ropes as resisting dampness. The total export of Sisal-hemp from Yucatan had reached already some years ago in value half a million sterling [D. Morris], it has now risen to two millions. The leaves are from 2 to 6 feet long and 2 to 6 inches wide; the flower-stem attains a height of 25 feet; the panicle of flowers is about 8 feet long, bearing in abundance bulb-like buds. Other large species of Agave, all fibre-yielding, are A. antillarum (Descourtil) from Hayti; A. Parryi (Engelmann) from New Mexico; A. Palmeri (Engelmann) from South-Arizona, up to a cool elevation of 6,000 feet. A. Ixtli (Kar-winski) seems to belong to A. rigida. Concerning the uses of

Agaves refer also to Dr. Fr. P. Porcher's "Southern Fields and Forests," p. 596-599 (1869), and to Consul Th. J. MacLain's report on the Sisal industry in the Bahamas [Dyer, "Kew Bulletin," July 1890.]

Agave vivipara, Linné.

Mexico and Honduras. This species is cultivated for hedges in some parts of India, especially near watercourses, and has in several districts become naturalised. Flowered at Mortala, [Th. Hanbury.] Latterly a fibre obtained from this plant has been sent to the London market as Bombay Aloe-fibre. Samples prepared by the Death's Fibre Machine Company were found to be of excellent quality, worth from £25 to £30 per ton. This species is of rather slow growth. Mr. J. G. Baker defines specifically 138 species.

Agonis flexuosa, De Candolle.

The Willow-Myrtle of South-Western Australia. A tree, attaining finally a height of 60 feet, with pendent branches. One of the best of evergreen trees for cemeteries in a climate free from frost. The foliage is rich in antiseptic oil.

Agriophyllum Gobicum, Bunge.

Eastern Asia. The "Soulchir" of the Mongols. Przevalsky says, that the seeds of this plant, wild as well as cultivated, afford a great part of the vegetable food of the Ala-Shan nomads. Several other annual salsolaceous herbs belong to the genus Agriophyllum, among them A. arenarium (Bieberstein) being closely cognate to A. Gobicum.

Agrostis Muelleri, Bentham.

Alps of Australia and New Zealand. Valuable there for depasturing, as well as some other grasses endemic to our alps.

Agrostis palustris, Hudson. (*A. alba,* Linné.)

The Fiorin or White Bent-Grass. Europe, Northern and Middle Asia, North-Africa, North-America. Perennial, showing a predilection for moisture; can be grown on peat-soil. It yields a good return already in the first year, but is not so well suited for mowing as depasturing. It is the herd-grass of the United States, and valuable as an admixture to many other grasses, as it becomes available at the season, when some of them fail. Sinclair regards it as a pasture-grass inferior to Festuca pratensis and Dactylis glomerata, but superior to Alopecurus pratensis. The variety with long suckers (A. stolonifera) is best adapted for sandy pastures, and helps to bind shifting sand on sea-coasts, or broken soil on river-banks. It luxuriates even on saline wet soil or periodically inundated places, as well observed by Langethal. It is more a grass for cattle-runs than for sheep-pastures, but wherever it is to grow,

the soil must be penetrable. Its turf on coast-meadows is particularly dense and of remarkable fineness. For sowing, only one-sixth of the weight of the seeds, as compared with those of the rye-grass, is needed. The creeping variety is also valuable for fine and enduring lawns.

Agrostis rubra, Linné.

Northern Europe, Asia and America. A perennial grass, called red-top and also herd-grass in the United States of North-America. Professor Meehan places it for value on pasture-land among grasses cultivated there next after Phleum pratense and Poa pratensis (the latter there called blue-grass), and before Dactylis glomerata, the orchard-grass of the United States.

Agrostis scabra. Willdenow.

The Hair-grass of North-America. Recently recommended as one of the best lawn-grasses, forming a dense turf. It will grow even on poor gravelly soil, and endure drought as well as extreme cold. Its fine roots and suckers spread rapidly, forming soon dense matted sods [Dr. Channing]. It starts into new growth immediately after being cut, is selected for its sweetness by pasture-animals, has proved one of the best grasses for dairy ground, and suppresses weeds like Hordeum secalinum. One bushel of seed to an acre suffices for pastures; two bushels are used for lawns. A. perennans (Tukermann) is an allied species of similar value.

Agrostis Solandri, F. v. Mueller.

Extra-tropical Australia and New Zealand. Produces a large quantity of sweet fodder in damp localities [Bailey]. Valuable as a meadow-grass [W. Hill]. In Australia it is essentially a winter-grass, but available also in our sub-alpine regions [J. Stirling]. Highly relished by all kinds of pasture-animals [Fr. Turner]. Chemical analysis in spring gave the following results: Albumen, 4.08; Gluten, 8.81; Starch, 1.34; Gum, 2.50; Sugar, 9.75 per cent. [F. v. Mueller and L. Rummel]. Under the name A. Forsteri (Roemer and Schultes) only some forms of this very variable grass are comprehended. Dr. Solander was the discoverer.

Agrostis vulgaris, Withering.

Europe, Northern Africa, Middle Asia, North-America. One of the perennial grasses which disseminate themselves with celerity, even over the worst of sandy soils. Though not a tall grass, it may be destined to contribute perhaps with others largely to the grazing capabilities of desert-lands; yet it will thrive also even in moist soil and alpine regions, and is essentially a grass for sheep-pastures; counted by Hein and many others also among valuable lawn-grasses.

Ailantus glandulosa, Linné.

South-Eastern Asia. A hardy deciduous tree, reaching 60 feet in height, of rather rapid growth and of very imposing aspect in any landscape. Particularly valuable on account of its leaves, which afford food to a silkworm (*Attacus Cynthia*) peculiar to this tree. Wood extremely durable, pale-yellow, of silky-lustre when planed, and therefore valued for joiners' work; it is tougher than that of oak or elm, easily worked, and not liable to split or warp. In Southern Europe this tree is much planted for avenues. Valuable also for reclaiming coast-sands, and to this end easily propagated by suckers and fragments of roots, according to Professor Sargent. The growth of the tree is quick even in poor soil, but more so in somewhat calcareous bottoms. Thrives on chalk [Vasey]. Professor Meehan states, that it checks the spread of the rose-bug, to which the tree is destructive. In Norway hardy to latitude 63° 26′ N. [Schuebeler], but suffers from frost in youth. The bark is used in the Levant as a vermifuge medicine. Goats will not devour saplings of this tree.

Aira cæspitosa, Linné.

Widely dispersed over the globe, reaching as indigenous also Australia. A rough fodder-grass, best utilized for laying dry any moist meadows; affords fair pasturage, if periodically burnt down [J. Stirling]. Extends to 71° 7′ N. in Norway [Schuebeler]. A. Kingii, A. antarctica and A. Magellanica (J. Hooker) are among nutritive congeners from extra-tropic South-America, the first particularly for cattle, the two other more for sheep [Hieronymus].

Akebia quinata, Decaisne.

Japan. A shrubby climber. This, as well as A. lobata (Decaisne) of the same country, bears rather large sweet fruits. The last-mentioned species extends as an indigenous one to China. Both have early and very fragrant flowers.

Albizzia basaltica, Bentham.

Eastern sub-tropic Australia. A small tree. The wood praised by Mr. P. O'Shanesy for its beautiful reddish color and silky lustre. Cattle like the foliage. As a genus Pithecolobium differs no more from Albizzia than Vachellia from Acacia or Cathartocarpus from Cassia. The oldest generic name is Zygia, but no species was early described under that name.

Albizzia bigemina, F. v. Mueller. (*Pithecolobium bigeminum,* Martius.)

India, up to Sikkim and Nepal, ascending in Ceylon to 4,000 feet Desirable for Australian forestry on account of its peculiar dark and hard wood. Another congener, A. subcoriacea (Pithecolobium subcoriaceum, Thwaites), from the mountains of India, is deserving of utilitarian cultivation with numerous other tall species.

Albizzia dulcis, F. v. Mueller. (*Pithecolobium dulce,* Bentham.)

Mexico. Advancing in tree-growth to 50 feet. Thorny. Has hardly a rival as a hedge-plant in frostless climes [W. Fawcett]. Particularly resisting sea breeze. The sweet pulp of the pod is regarded as wholesome. Ripens its fruit as far south as Moreton-Bay [F. Turner].

Albizzia Julibrissin, Durazzini.

From the Caucasus to Japan. A favorite ornamental red-flowering Shade-Acacia in Southern Europe. Naturally it seeks river-banks.

Albizzia latisiliqua, F. v. Mueller. (*Lysiloma latisiliqua,* Bentham.)

Tropical America. A large spreading tree; trunk attaining a diameter of 3 feet; wood excellent for select cabinet-work, excelling according to Nuttall the Mahogany in its variable shining tints, which appear like watered satin; it is hard and close-grained.

Albizzia Lebbek, Bentham.

The Siris-Acacia of Southern and Middle Asia and Northern Africa. Available as a shade-tree. It produces also a good deal of gum; the flowers much sought for honey by bees. In warm regions easily naturalized from seeds. An allied species is the North-Eastern Australian A. canescens (Bentham).

Albizzia lophantha, Bentham. (*Acacia lophantha,* Willdenow.)

South-Western Australia. One of the most rapidly-growing plants for copses and first temporary shelter in exposed localities, but never attaining the size of a real tree. It produces seeds abundantly, which germinate most easily. For the most desolate places, especially in desert-tracts, it is of great importance, quickly affording shade, shelter and a copious vegetation. Cattle browse on the leaves. The bark contains only about 8 per cent. mimosa-tannin; but Mr. Rummel found in the dry root about 10 per cent. of saponin, so valuable in silk- and wool-factories. Saponin also occurs in Xylia dolabriformis of Southern Asia. In Australia this plant is found better even than the Broom-bush for sheltering new forest plantations in open sand-lands; in rich soil known to have grown 14 feet in a year.

Albizzia micrantha, Boivin. (*A. odoratissima,* Bentham.)

India; ascending to 5,000 feet; growing in almost any kind of soil; hardy in sub-tropical countries. A middle-sized tree; timber particularly hard, dark-colored, durable and strong; well adapted for naves and felloes [Drury and Brandis]. Regarded by Roxburgh as one of the most valuable jungle-timbers.

Albizzia procera, Bentham.

South-Eastern Asia and North-Western Australia, but enduring mild extra-tropic climes. Height to 100 feet. Growth more rapid than that of the Siris. Among the limited numbers of trees, fit to live on saltish land.

Albizzia Saman, F. v. Mueller.* (*Pithecolobium Saman*, Bentham.)

The "Rain-tree" or "Guango," extending from Mexico to Brazil and Peru. It attains a height of 70 feet, with a trunk 6 feet in diameter, the colossal branches expanding to 150 feet; it is of quick growth, and in outline not unlike an oak; it is content with light soil, and forms a magnificent feature in a landscape. Truly splendid for shade; almost unapproached for rapid growth by any other tree. In Fiji it attained a stem-circumference of 9 feet in 7 years, and a height of about 50 feet, with some branches spreading over 40 feet from the short trunk. It can be trimmed to form a tall stem [R. L. Holmes]. At Port Curtis it grew 6 feet in 15 months, and it fruits there already at a comparatively early age [Edgar]. Near the Apsley-River in New South Wales, it rose to 16 feet in two years sown on very poor ground (A. R. Crawford). In India it attained in 10 years a stem-girth of about 6 feet at 5 feet from the ground, its ramifications by that time spreading out to 90 feet [Blechyndon]. It thrives particularly in the dry salt-pond-districts of the West-Indies, and likes the vicinity of the sea, "its foliage possessing the power, to an unusual extent, to attract, absorb and condense aerial humidity" [Consul for France at Laroto]. Not ascending to above 1,000 feet altitude in Jamaica; resisting drought, but very susceptible to frost. The pods mature for fodder at a time, when grass and herbage on pastures become parched. Rain and dew fall through the foliage, which is shut up at night, thus allowing grass to grow underneath. The tree thrives best, where the rainfall fluctuates between 30 and 60 inches a year. One of the best trees in mild climates for shade by the roadsides. The wood is hard and ornamental; but the principal utility of the tree lies in its pulpy pods, which are produced in great abundance, and constitute a very fattening fodder for all kinds of pastoral animals, which eat them with relish [Jenman, J. H. Stephens].

Albizzia stipulata, Bentham.

Continental and insular South-Asia, extending to the Himalayas and China, ascending to 4,000 feet. An umbrageous tree of easy culture, for which it is not quite restricted to the tropics.

Albizzia Timbouva, F. v. Mueller. (*Enterolobium Timbouva*, Martius.)

La Plata States. A good-sized tree with elastic wood, well adapted for promenades. Bark comparatively rich in mimosa-tannic acid [Prof. Hieronymus].

Aletris farinosa, Linné.

The "Colic-root" of the woodlands of Eastern North-America. This pretty herb is of extreme bitterness, and is employed medicinally as a tonic, also in dropsy and chronic rheumatism.

Aleurites cordata, R. Brown.

From Japan to Nepal, also in Bourbon. This tree deserves cultivation for its beauty and durable wood in warm humid districts. The oil of the seeds serves as a varnish. Perhaps in localities, quite free from frost, it would be of sufficiently quick growth extra-tropically.

Aleurites triloba, R. and G. Forster.

The "Candlenut-tree," a native of some of the tropical regions of both hemispheres; it furnishes a valuable dye from its fruit-shell and copious oil from its seeds, the yield being about one-third. I found the tree barely able to endure the winters of Melbourne, but at Moreton-Bay heavy returns of seeds are annually obtained; they are edible only after roasting, and when consumed in quantity they are unwholesome.

Alibertia edulis, A. Richard.

Guiana and Brazil, southward to extra-tropic latitudes, widely dispersed through the drier regions. The fruit of this shrub is edible and known as "Marmeladinha." A. Melloana (J. Hooker), of Southern Brazil, seems to serve the same purpose.

Alkanna tinctoria, Tausch.

On sandy and calcareous places around and near the Mediterranean Sea, extending to Hungary. Endures a very dry clime. Cultivated in the open air to perfection up to 59° 55′ N., by Professor Schuebeler. This perennial herb yields the "alkanna-root," used for dying oleaginous, waxy and other substances. It might be naturalised. Can be grown in almost pure coast-sand.

Allium Ampeloprasum, Linné.

The British Leek. Middle and Southern Europe, Western Asia and North-Africa. Called in culture the Summer-Leek, a variety of which is the Pearl-Leek. The specific name arose already from Dioscorides' writings.

Allium Ascalonicum, Linné.

The Shallot. South-Western Asia. Specific name already used by Theophrastos and Plinius. Ripens seeds even in Central Australia [Rev. H. Kempe].

Allium Canadense, Kalm.

Eastern North-America. This Garlic could be cultivated or naturalised on moist meadows for the sake of the tops of its bulbs, which are sought for pickles of superior flavor.

Allium Cepa, Linné*

The ordinary Onion. Wild in Turkestan [Dr. A. Regel]. Succeeds even in equatorial countries [Cantley]; it matures seeds, fit to germinate, in the hottest desert-regions of Central Australia. As much as 20 tons of onions have been harvested from an acre of land in the Bellarine-district of Port Phillip. The import into the United Kingdom in 1884 represented £552,000, also during 1886 full half a million sterling. The export from Victoria during 1887 came to 6,036 tons, valued at £33,482. One of the staple-products of Bermuda [Sir J. Lefroy]. Among the principal culture-plants of ancient Egypt [Dr. Schweinfurth]. At Aschersleben and Quedlinburg alone about 130,000 lbs. of onion-seeds are raised annually [B. Stein]. The specific name in use already by Plinius and Columna. Raw onions quench excessive thirst. Onions moistened with alcohol are highly adapted for cleaning gilt frames.

Allium fistulosum, Linné.

Central Asia. The Welsh Onion.

Allium gracile, Dryander. (Nothoscordum fragrans, Kunth.)

North-America, far south in mild climes, easily becoming spontaneous. Serves as a kitchen-vegetable. A. striatum Jacquin) is a closely allied plant, which extends from the United States to Chili.

Allium Porrum, Linné.

The Leek. Already cultivated in Egypt at Moses' time. Regarded by Gay and Regel as a cultural variety of A. Ampeloprasum. Matures seeds in the hottest and driest regions of Australia.

Allium roseum, Linné.

Countries on the Mediterranean Sea. This with Allium Neapolitanum (Cyrillo), one of its companions, yields edible bulbs, according to Heldreich.

Alchemilla vulgaris, C. Bauhin.

Europe, West-Asia, Arctic North-America, Alpine Australia; extending in Norway to 71° 10′ N. [Schuebeler]. This perennial herb is important for moist dairy-pastures. The same can be said of other congeners; for instance, A. alpina (L.) from the coldest parts of Europe, North-Asia and North-America; A. Capensis (Thunberg) and A. elongata (Ecklon and Zeyher) of South-Africa, some Abyssinian species, as well as A. pinnata (Ruiz and Pavon) and other congeners of the Andes.

Allium rubellum, Bieberstein. (*A leptophyllum,* Wallich).

The Himalayan Onion. Captain Pogson regards the bulbs as sudorific; they are of stronger pungency than ordinary onions; the leaves form a good condiment.

Allium sativum, C. Bauhin.

The Garlic. Soongarei and in the farthest N.W. of India, as shown by Dr. von Regel; but cultivated already in ancient Egypt [Dr. Schweinfurth]. Nearest allied to A. Scorodoprasum. The "Allium" of Plinius.

Allium Schœnoprasum, Linné.

The Chives. Europe, Northern Asia and North America. Cultivated in Norway to latitude 70° 22′ [Schuebeler]. Available for salads and condiments. This species of Allium seems here not yet so generally adopted in our culinary cultivation as other congeners.

Allium Scorodoprasum, Linné.

The Sand-Leek. Europe and North-Africa. Resembles in some respects Garlic, in others Shallot. The Scorodoprason of Dioscorides according to Fraas seems A. descendens (Linné) indigenous to South-Europe.

Alnus acuminata, Humboldt.

From Mexico to Chili; particularly at subalpine elevations. There among the best of timber-trees [Prof. Sodiro].

Alnus glutinosa, Gaertner.

The Common Alder. Throughout Europe and extra-tropical Asia; indigenous to 64° 10′ N. lat. in Norway [Schuebeler]. Reaches a height of 90 feet; attaining even in lat. 61′ 47′ a stem-diameter of 10 feet. Easily clipped, when young, into hedges; well adapted for river banks; recommended by Wessely for wet valleys in coast-sand; wood soft and light, turning red, furnishing one of the best charcoals for gunpowder; it is also durable under water, and adapted for turners' and joiners' work; the wood is also well

suited for pump-trees and other under-ground work, as it will harden almost like stone. The tree is further valuable for the utilisation of bog-land. A. cordifolia (Tenore) is a closely allied species, indigenous to the countries at and near the Mediterranean Sea. A. incana (Willd.) extends to North-America; it is of smaller size but was found to grow over 60 feet high in latitude 70° of Norway by Professor Schuebeler. The bark of several alders is of medicinal value, and a decoction will give to cloth saturated with lye an indellible orange-color [Porcher]; it contains a peculiar tannic principle to the extent of 36 per cent. [Muspratt]. American alder-extract has come into use for tanning; it renders skins particularly firm, mellow and well-colored [Eaton]. A. Oregana (Nuttall), of California and Oregon, rises to a height of 80 feet; its wood is extensively used for bent-work [Meehan]. A. Japonica and A. firma (Siebold and Zuccarini), of Japan, furnish wood there for carvers and turners, and bark for black dye [Dupont]. A. rubra (Bongard), the Red or Tag-Alder of California and British Columbia, rises to fully 100 feet, and gets finally a stem diameter of 6 feet. The timber is excellent for piles and bridge-bottoms, also for pumps, and proved exceedingly durable; it serves further for carving, turnery, furniture, machinery [Dr. Kellogg].

Alnus Nepalensis, D. Don.

Himalayas, between 3,000 and 9,000 feet. Reaches a height of 60 feet. With another Himalayan alder, A nitida (Endlicher), it can be grown along streams for the sake of its wood.

Aloe dichotoma, Linné fil.

Damaras and Namaqua-land. This species attains a height of 30 feet, and occasionally an expanse of 40 feet. The stem is remarkably smooth, with a girth sometimes of 12 feet. It is a yellow-flowering species. A. Bainesii is still more gigantic than the foregoing, it attaining exceptionally a height of 60 feet [Dyer]; it occurs in Caffraria and Natal, with a stem 16 feet in circumference at 3 feet from the ground [Rev. R. Baur]. A. Barberæ is identical, according to Mr. J. G. Baker. A. speciosa (Baker) rises also to a height of 25 feet. All grand scenic plants.

Aloe ferox, Miller.

South-Africa. This species yields the best Cape-aloes, as observed by Dr. Pappe. The simply inspissated juice of the leaves of various species constitutes aloe-drug, well known as a drastic purgative. It is best obtained by using neither heat nor pressure for extracting the sap. By re-dissolving the aqueous part of aloes in cold water, and reducing the liquid through boiling

or other processes of exsiccation to dryness, the extract of aloes is prepared. The bitter sap, used for dressing wounds, keeps off flies very effectually. Deserves introduction particularly in veterinary practice. All species are highly valuable, and can be used, irrespective of their medicinal importance, easily and inexpensively to beautify any rocky or otherwise inarable spot.

Aloe linguiformis, Miller.

South Africa. According to Thunberg, the purest gum resin is obtained from this species.

Aloe Perryi, Baker.

Socotra. It is now known, that it was this species, which furnished the genuine "Aloes," renowned in antiquity [Prof. B. Balfour]. It grows best in limestone-soil, and ascends to 3,000 feet. Flowers turning from scarlet to yellow. Closely allied to A vulgaris.

Aloe plicatilis, Miller.

South Africa. The drug of this species acts more mildly than that of A. ferox.

Aloe purpurascens, Haworth.

South Africa. Another of the plants, which furnish the Cape-aloes of commerce. The South-African Aloe arborescens (Miller) and A Commelyni (Willdenow) are also utilized for aloes, accord-to Baillon, Saunders and Hanbury.

Aloe spicata, Thunberg.

South-Africa. This also furnishes Cape-aloes, and is an exceedingly handsome plant.

Aloe vera, Miller. (*A. succotrina,* Lamarck.)

South-Africa. A purplish-flowered species, figured already by Commelyn in 1697 [Baker]. Yields the common Socotrine-aloes and Moka-aloes.

Aloe vulgaris, Bauhin. (*A. vera,* Linné; *A. Barbadensis,* Miller.)

The Yellow-flowered Aloe. Countries around the Mediterranean Sea, also Canary-Islands, on the sandy or rocky sea-coast. Such places could also be readily utilized elsewhere for this and allied

plants. Dr. Sibthorp has identified this species with the Aloe of Dioscorides; thus it is also the real Aloe of Plinius; hence it is not probable, that A. vulgaris is also simultaneously of American origin, although it is long cultivated in the Antilles, and furnishes from thence the main supply of the Barbadoes-aloes, also Curaçoa-aloes; likewise in East-India this species seemingly only exists in a cultivated state. Haworth found the leaves of this and of A. striata softer and more succulent than those of any other aloe. It is said to be the only species with yellow flowers among those early known, and it is also the only one, which Professors Wilkomm and Parlatore record as truly wild in Spain and Italy.

Aloexylon Agallochum, Loureiro.

Cochinchina, on the highest mountains. The precious aloe-wood, so famed from antiquity for its balsamic fragrance and medicinal properties is derived from this tree.

Alopecurus bulbosus, Hudson.

Middle- and South-Europe. An important rural grass for salt-marshes.

Alopecurus geniculatus, Linné.

Europe, Asia, North-Africa. A perennial fodder-grass, valuable for swampy ground; easily naturalised.

Alopecurus pratensis, Linné.*

Meadow "Fox-tail" grass. Europe, Northern Africa, Northern and Middle Asia. In Norway indigenous to lat. 69° 11′ [Schuebeler]. One of the best of perennial pasture-grasses. It reaches its full perfection only after a few years of growth, as noticed by Sinclair. For this reason it is not equal to Dactylis glomerata for crop-rotation, but it is more nutritious than the latter, although the annual return in Britain has proved less. Langethal places it next to Timothy-grass for artificial pastures. Sheep thrive well on it. Sinclair and others have found that this grass, when exclusively combined with white clover, will support after the second season five ewes and five lambs on an acre of sandy loam; but to thrive well it needs land not altogether dry. In all permanent artificial pastures this Alopecurus should form one of the principal ingredients, because it is so lasting and so nutritive, and earlier in the season than most other grasses. Can be grown also with advantage in orchards. It is likewise one of the best grasses for maritime or alluvial tracts of country. In alpine regions it would also prove prolific, and might gradually convert many places there into summer-pastures. It does not altogether dislike shade, is early flowering and likes the presence of lime in the soil. Yield of hay on good soil, according to Dr. Stebler, about 80 cwt. per acre. Schuebeler lauds particularly the variety nigricans.

Alpinia Galanga, Willdenow. (*Hellenia Galanga,* F. v. Mueller.)

China. Probably as hardy as the Ginger-plant. From this Alpinia, not from Zingiber, the candied roots known as Chinese preserved ginger are obtained [Dyer's "Kew Bulletin," No. 49, 1891]. By the dictates of strict priority the generic name of Alpinia should supersede that of Renealmia, as Plumier's and Linne's genus rests entirely on a Central American plant, so that the genus Hellenia may be restored for what later writers have mainly called Alpinias.

Alstonia constricta, F. v. Mueller.

Warmer parts of East-Australia, particularly in the dry inland-districts. The bark of this small tree is aromatic-bitter, and regarded as valuable in ague, also as a general tonic. It is allied to the Dita-bark of India and North-Eastern Australia, procured from Alstonia scholaris (R. Brown). From its bark a peculiar alkaloid, the Porphyrin of Hesse and some other chemical principles can be prepared. The sap of all Alstonias should be tried for caoutchouc, that of A. plumosa and another species yielding Fiji-rubber [Hooker].

Alstrœmeria pallida, Graham.

Chili. Palatable starch can be obtained from the root of this plant, which for its loveliness alone deserves a place in any garden. The tubers of other of the numerous Alstrœmerias can doubtless be practically utilised in a similar manner.

Alstrœmeria spectabilis, (*Bomarea spectabilis,* Schenk.)

Brazil. The tuberous roots when roasted are edible [Dr. Theodor Pockolt].

Althæa officinalis, Linné.

The real "Marsh-Mallow." Europe, Northern Africa, Northern and Middle Asia. Hardy to lat. 59° 55′ in Norway [Schuebeler]. A tall perennial herb, with handsome flowers. The mucilaginous root and also the foliage are used for medicinal purposes, the roots chiefly as expectorant internally, the leaves as poultices externally. The plant succeeds best on damp, somewhat saline soil.

Amarantus Blitum, Linné.

Southern Europe, Northern Africa, South-Western Asia. This annual herb is a favorite plant amongst allied ones for spinage, but not the only one used of this genus, as also many others quite as well serve for culinary purposes. The dried plant contains 10 to 12 per cent. nitrate of potash. It arrives at maturity in two or three months, producing on favorable soil about 4 tons per acre, calculated to contain about 400 lbs. saltpetre. 'A. cruentus L., A. hypochondriacus L. and A. caudatus L. are cultivated in Ceylon,

though not all of the agreeable taste of real spinage. A. Mangostanus, A. Gangeticus, A. melancholicus, A. tristis, L. and A. polystachyus, Willdenow, likewise furnish in Southern Asia either foliage for spinage or seeds for porridge. Amarants for spinage must be well boiled and the water repeatedly changed.

Amarantus paniculatus, Linné. (*A. frumentaceus,* Royle.)

In tropical countries of Asia and also America. An annual herb, attaining a height of 6 feet, yielding half a pound of floury nutritious seeds on a square yard of ground in three months, according to Roxburgh. Extensively cultivated in India for food-grain, especially as an autumn-crop; the leaves serve as vegetable.

Amelanchier Botryapium, De Candolle.

The "Grape-pear" of North-Eastern America; also called "Shadbush." Cultivated in Norway as far north as 59° 55' [Schuebeler]. This handsome fruit-tree attains a height of 30 feet. Wood extremely hard, heavy and tough. The purplish or almost black fruits are small, but of pleasant subacid taste, ripen early in the season, and are borne abundantly; Mr. Adams, of Ohio, has calculated the yield at 300 bushels per acre annually, if the variety oblongifolia is chosen; it is the Dwarf "June-berry" of North-America. This bush or tree will live on sandy soil; but it is one of those hardy kinds particularly eligible for alpine ground; it is remarkably variable in its forms.

Amelanchier alnifolia, Nuttall.

North-Western America. Allied to the following. The autochthones store the dried fruit for winter-use. The wood is so tough as to be used for rollers and for teeth of wheels in machinery [Dr. G. Dawson].

Amelanchier vulgaris, Mœnch.

Countries at and near the Mediterranean Sea, ascending to subalpine regions. The edible fruits of this shrub are a marketable article in South-Europe [Naudin].

Amorphophallus Konjac, C. Koch. (*A. Rivierii,* Durieu.)

Cochinchina, but comes to perfection also in cooler countries; thus cultivated in Japan for its edible tubers, which sometimes reach a foot in thickness.

Anabasis Ammodendron, C. A. Meyer. (*Haloxylon Ammodendron,* Boissier.)

From the Ural and Altai to Persia and Turkestan. The only arborescent plant in some of the drift-sandy deserts of that region, recommended by Dr. von Regel for naturalisation in other sandy or saline arid tracts. It is leafless, and attains a height of 20 feet. Endures a soil temperature of half the heat of boiling water. Wood hard and dense.

Anacylus Pyrethrum, De Candolle.

Countries near the Mediterranean Sea. The root of this perennial herb is used medicinally, chiefly as an anodyne for mastication, in infusion against rheumatism; even antiparalytic properties are ascribed to it. The plant is recognised by many pharmacopœas.

Ananas sativa, Schultes.*

South-America. The famous "Pine-apple" plant. Some varieties ripen their fruit as far south as Port Jackson. Mr. Th. Mead remarks, that in Florida the plant is well sustained by merely piling a little brush over it during the three cool months of the year. Fruits even to 10 lbs. weight have there been produced. Thrives to perfection just outside the tropics of East-Australia, fruits up to 10 lbs. having been realised there [Edgar]. From the Bahamas alone about £50,000 worth are now annually exported. The leaf-fibre is exceedingly fine and so strong, that a rope of $3\frac{1}{4}$ inch circumference will bear a strain of 57 cwt. A beautiful fabric can be made from it [W. T. Dyer]. Miller distinguished already this plant generically.

Andropogon annulatus, Forskael.

Intra- and sub-tropical Africa, Asia and Australia. Recommended by Mr. Walter Hill as a meadow-grass. Dr. Curl observes, that in New Zealand it is both a summer- and autumn-grass, that it does not grow fast in winter, but at the period of its greatest growth sends up an abundance of foliage.

Andropogon argenteus, De Candolle.

Pronounced by Leybold to be one of the best pasture-grasses of the Cordilleras of Chili.

Andropogon australis, Sprengel. (*Sorghum plumosum,* Beauvois.)

Tropical and also Eastern extra-tropic Australia as far south as Gippsland. Brought under notice by Mr. Ch. Moore as an admirable perennial pasture-grass. The allied A. serratus (Thunberg) of tropical Australia, Southern Asia, China and Japan, serves similar purposes. General Sir H. Macpherson proved some Indian Andropogons well adapted for Silos.

Andropogon avenaceus, Michaux. (*Sorghum avenaceum,* Willdenow.)

Northern and Central America. This tall perennial grass lives in dry sandy soil, and should be tried for growth of fodder.

Andropogon bombycinus, R. Brown.

Australia. This robust grass, which is generally well spoken of by graziers, seems to like a somewhat strong soil, and is often found among rocks on hill-sides. The bases of the stems of this species, like of several others of the genus, are highly aromatic

[Bailey]. Will live in shifting sand, and endures the hottest desert-clime. The Australian A. procerus (R. Br.) and the Mediterranean A. laniger (Desf.) are closely allied congeners.

Andropogon Calamus, Royle.

Central-India. The "Sweet Cane" and "Calamus" of Scripture, according to Calcott; it is regarded as the aromatic reed of Dioscorides by Royle. From this species the gingergrass-oil of Nemaur, an article much used in perfumery, is distilled. It is the "Cusha" of India. Gibson and Dalzell regard it identical with A. nardoides (Nees) of South-Africa.

Andropogon cernuus, Roxburgh.* (*Sorghum cernuum,* Willdenow.)

One of the Guinea-corns. India, where it is much cultivated, as in other tropical countries. It is annual according to Hackel, but Roxburgh distinctly asserts, that "the plant is of two or more years duration, if suffered to remain." It forms the "staff of life" of the mountaineers beyond Bengal. It reaches a height of 15 feet, with leaves over 3 feet long. The thick stems root at the lower joints, and cattle are very fond of them. The grain is white. The specific limits of the various sorghums are not well ascertained. This belongs to the series of A. Halepensis.

Andropogon erianthoides, F. v. Mueller.

Eastern sub-tropical Australia. Mr. Bailey observes of this perennial species, that "it would be difficult to find a grass superior for fodder to this; it produces a heavy crop of rich, sweet, succulent foliage; it spreads freely from roots and seeds, and shoots again when fed down." Mr. Fred. Turner states, that this grass is particularly relished by pasture-animals.

Andropogon falcatus, Steudel.

India and Queensland. Considered by Mr. Bailey a good lawn-grass, as it is of dwarf compact growth and of bright verdure.

Andropogon filipendulinus, Hochstetter. (*A. lachnatherus,* Bentham.)

Warmer regions of Australia, also in Eastern Africa. Much liked by pasture-animals; grows readily in poor stony ground [A. R. Crawford]; forms very large patches.

Andropogon furcatus, Muehlenberg.

South-Eastern States of North-America. Adapted for consolidating drift-sand of coasts [Prof. Naudin].

Andropogon Gryllus, Linné.

In the warm temperate and the hot zone of the eastern hemisphere. A perennial pasture-grass, of easy dissemination, with some congeners useful in climes too arid for more tender grasses.

Andropogon Halepensis, Sibthorp.* (*Sorghum Halepense,* Persoon.)

Southern Europe, warmer parts of Asia, Northern Africa. Praised already by Theophrastos more than 2,000 years ago. Not easily repressed in moist ground. A rich perennial grass, cultivated often under the name of Cuba-grass and Johnson-grass. All the vernacular names, given to this grass, should be discontinued in maintaining the very appropriate original appellation "Haleppo-grass." It keeps green in the heat of summer [J. L. Dow]; is not eaten out by pasture-animals [Hollingsworth]; it will also grow in drift-sand of the coast, and will keep growing during the dry season, when most other grasses fail, but improves much on irrigation; the roots resist some frost; three tons can be cut from one acre in a single season; it yields so large a hay-crop, that it may be cut half a dozen times in a season, should the land be rich. All kinds of stock have a predilection for this grass. It will mat the soil with its deep and spreading roots; hence it should be kept from cultivated fields. Detrimental to Lucerne on meadows [Rev. Dr. Woolls]. In Victoria hardy up to 2,000 feet elevation.

Andropogon involutus, Steudel.

From Nepal to China. The "Sabe" or "Bhabar" or "Bhaib-Grass." Used for the manufacture of ropes, string-matting and other textile articles: approaches Esparto in the quality of its fibres; perennial; grows readily on dry soil [Dr. Hance]. Dr. W. Thiselton Dyer has shown, that a particular fibre, alluded to by Royle and some subsequent writers as emanating from Eriophorum comosum (Wallich) in Upper India, is derived from this Andropogon, both plants growing there promiscuously.

Andropogon Ischaemum, Linné.

Southern Europe, Southern Asia, Africa. One of the fittest of grasses for hot dry sand-regions, and of most ready spontaneous dispersion. Perennial. Succeeds well on lime-soil and that containing gypsum. In its new annual upgrowth it is particularly liked by sheep. It needs burning off in autumn.

Andropogon Ivarancusa, Blane.

Southern Asia and Tropical Africa. The well known root is of aromatic taste with some bitterness. The plant is nearest allied to A. laniger (Desfontaines) according to Hackel.

Andropogon montanus, Roxburgh.

Southern Asia, Northern and Eastern Australia. Rapid in growth and valuable for fodder when young; resists fire better than many other grasses [Holmes]. Seeds freely [F. Turner]. Perennial, like most other species of this large genus.

Andropogon muricatus, Retzius.

India. The "Vitivert" or "Kus-kus." A grass of delightful fragrance. According to Surgeon-Major Dr. G. King, the odorous Indian mats are made of this grass, and according to Prof. Lindley, awnings, tatties, covers for palanquins and screens are manufactured from this species; also an essence is distilled from it.

Andropogon Nardus, Linné. (*A. Martini*, Thwaites.)

From Southern Asia to Northern Australia, also in tropical and sub-tropical Africa, but in different varieties. Perennial. One of the lemon-scented species. Prof. Hackel suggests, that A. Calamus may be referable to this species. Kunth unites with this A. citriodorus (De Candolle), the A. citratus of many botanic gardens, while Link referred this grass to A. Schœnanthus. It yields an essential oil for condiment and perfumery, and is occasionally used for tea. Simmonds gives the export-value of this oil as from Ceylon alone as £7,000. "Citrionella" Oil to the extent of 40,000 lbs. annually is in Ceylon distilled from this grass [Piesse]. Endures the winters of Port Phillip [S. C. Kiernander].

Andropogon nutans, Linné. (*Sorghum nutans*, Gray).

Eastern North-America. A tall, nutritious, perennial grass, content with dry and barren soil, too poor for still better grasses.

Andropogon pertusus, Willdenow.

Southern Asia, Tropical and Sub-tropical Australia. Perennial. Mr. Nixon, of Benalla, regards it as one of the best grasses to withstand long droughts, while it will bear any amount of feeding. It endures cold better than some other Andropogons of Queensland, according to Mr. Bailey's observations. Though not so palatable to pasture-animals as some other grasses, this one is important for the summer-season, when many others fail in the arid interior.

Andropogon provincialis, Lamarck.

Southern Europe. Strongly recommended by Bouché for fixing loose maritime sand. Attains a height of 5 feet. A. furcatus (Muehlenberg) is the same species, according to Hackel, seemingly immigrated and naturalised in the United States.

Andropogon refractus, R. Brown.

Northern and Eastern Australia, Polynesia. Mr. Bailey observes of this perennial grass, that it is equally excellent for pasture and hay, and that it produces a heavy crop during summer; the root is fragrant. According to Mr. Holmes, it is easily inflammable, of inferior fodder-value, hardly ever touched by cattle on account of its scent, but is particularly used for mattrasses in Fiji.

Andropogon saccharatus, Roxburgh.* (*Sorghum saccharatum,* Persoon.)

Tropical Asia, or perhaps only indigenous in equatorial Africa. The Broom-corn or Sugar-Millet; also passing as "Durra," "Dochna," and "Battari." Tall, usually annual. Produces of all grasses, except the Teosinté and maize, the heaviest of any fodder-crops in warm climates. From the saccharine juice sugar is obtainable, A sample of such, prepared from plants of the Melbourne Botanic Garden, was shown already at the Exhibition of 1862. This Sorghum furnishes also material for a well-known kind of brooms. Mr. Simmonds relates, that as many as 150,000 doz. of these brooms have been made in one single factory during a year. To pigs this plant is very fattening also. Mr. F. Rosan obtained by the aid of irrigation as much as 30 tons of cut sorghum in a season from an acre on the Lower Murray-River. The plant can be advantageously utilised for preparing syrup. For this purpose the sap is expressed at the time of flowering, and simply evaporated; the yield is from 100-200 gallons from the acre. Already in 1860 nearly seven millions of gallons of sorghum-treacle were produced in the United States. General Le Duc, then Commissioner for agriculture at Washington, stated, that Mr. Seth Kenny, of Minnesota, obtained from the "Early Amber" variety of this Sorghum up to 250 gallons of heavy syrup per acre. Machinery for the manufacture of sorghum-sugar on plantations can be erected at a cost of £50 to £100. Sorghum-juice can be reduced to treacle and sugar without the use of chemicals, beyond clearing with lime and neutralising the lime, remaining in the juice, by sulphurous acid. Raw sorghum-sugar is nearly white. By an improved method Mr. F. L. Stewart obtained 10 lbs. of sugar from a gallon of dense syrup. At the State-University's experimental farm, in Wisconsin, Professors Swenson and Henry have proved, that sorghum-sugar, equal to the best cane-sugar, can be produced at $4\frac{1}{2}$ cents per pound. The seeds are very valuable for stable-fodder as well as for poultry-feed, and may even be utilised for bread and cakes. The stem can be used as a culinary vegetable. See also the elaborate chemical reports by Dr. P. Collier, Washington, 1880-2; further, the essay by Commissioner Hon. G. B. Loring, 1883. In connection with the new and extensive irrigation-scheme of the Victorian Government, initiated by the Honorable Alfred Deakin, the culture also of the Sugar-Millet should assume grand dimension in regions hitherto too dry for it.

An able report from a committee of the National Academy of Science, submitted to the senate of the United States on the sugar-producing capacity of the Sorghum, gives the following conclusions: That from about 4,500 most accurate analyses, instituted by Dr. Collier in the Department of Agriculture in Washington, the presence of cane-sugar in the juice of the best varities of Sorghum (Amber, Honduras and Orange) in such quantity is established, as to equal the yield of that of sugar-cane, the average quantity of crystallisable sugar in the juice being 16 per cent., the average

yield of juice in stripped stalks from plants grown at Washington being 58 per cent., the sugar really obtainable by ordinary process of manufacture from the juice being 11.30 per cent. It is further demonstrated, that the Sorghum-stalks should be cut only, when the seeds are already of a doughy consistence or still harder, that the stalks should be worked up immediately after cutting; further it is shown, that the sugar from Sorghum is not inferior to that from cane or beet, and that excellent sugar can likewise be obtained from maize; that Sorghum, when advancing to maturity, will resist some frost; that no more than $12\frac{1}{2}$ per cent. of the sugar is lost by the evaporation of the juice to syrup, quite as great a loss taking place in the juice of sugar-cane by defacation, skimming and inversion (change into glucose or grape-sugars). The committee considered this new Sorghum-industry placed already on a safe and profitable footing. Sorghum-stubbles are of surprising value as pastoral feed. Sugar-Sorghum was introduced into the United States for rural purposes only 30 years ago; but its culture spread with unexampled rapidity there, having only its counterpart in the tea- and cinchona-culture of the last decennia in India. The process of manufacture of sugar from Sorghum is not more difficult than that of cane, and less complicated than that of beet. Some varieties mature in 80 days, others require twice that time, the Orange-variety becomming perennial, and is with the Amber-variety most saccharine, while the Honduras-variety gives a very heavy crop; the broomcorn-variety is poor in sugar. Sorghum will thrive well in sandy loam too light for maize and in a clime too dry for that corn, and can be grown closer. The variety A. bicolor (Roxburgh) ripens its seeds in Lower India within three or four months of the time of sowing, the produce being often upwards of one hundred-fold, and the grain particularly wholesome for human sustenance. Sorghum giganteum (Edgeworth) represents a form of very tall growth.

Andropogon Schœnanthus, Linné. (*A. Martini,* Roxburgh.)

Southern Asia, extending to Japan, also in Africa. One of the "Lemon-grasses." It will live in arid places. The medicinal Sirri-Oil is prepared from the root. The Australian A. bombycinus (R. Brown) approaches in affinity this species.

Andropogon scoparius, Michaux.

North-America. Takes permanent possession of sandy or otherwise poor land, and is regarded as one of the best forage-resources of the prairies.

Andropogon sericeus, R. Brown.

Hotter regions of Australia, even in desert-tracts, also extending to New Caledonia and the Phillipine Islands. A fattening perennial pasture-grass, worthy of praise. Yields enormously during the dry summer-months [Fr. Turner].

Andropogon Sorghum, Brotero.* (*Sorghum vulgare,* Persoon.)

The large "Indian millet" or Guinea-corn" also "Durra." Warmer parts of Asia, but according to Alph. de Candolle perhaps indigenous only in tropical Africa. It matures seed even at Christiania in Norway [Schuebeler]. A tall annual plant. The grains can be converted into bread, porridge and other preparations of food. It is a very prolific corn; Sir John Hearsay counted 12,700 seeds on one plant; it is particularly valuable for green fodder. The panicles are used for carpet-brooms, the fibrous roots for velvet-brushes. The grain of this millet is in value superior to that of A. saccharatus. A variety (A. caffrorum, Kunth) yields the "Kaffir-corn," which sort is particularly drought-resisting [James Henderson]. The "Imphee" affords a superior white food-grain. Even A. saccharatus can be only regarded as an extreme form of A. Sorghum on the high authority of Prof. Hackel. In Central Australia it ripens within three months [Rev. H. Kempe]. Succeeds in dry regions, where Euchlaena does not come to full development. A kind of beer, called "Merisa," is prepared from the seed. Many others of the numerous species of Andropogon, from both hemispheres, deserve our attention.

Anemone Pulsatilla. Linné.

Europe and Northern Asia. On limestone-soil. This pretty perennial herb is of some medicinal importance, acting in many respects similar to aconitum. A. pratensis and A. patens (Linné) are of like value, the latter extending to North-America.

Angophora intermedia, De Candolle.

South-Eastern Australia. This is one of the best of the Angophoras, attaining a large size, and growing with the rapidity of an Eucalyptus, but being more close and shady in its foliage. It would be a good tree for lining public roads and for sheltering plantations. The Rev. J. Tenison Woods states, that it is not rarely over 150 feet high, that the wood is hard and very tough, bearing dampness well, but that the many kino-particles lessen its usefulness. Carefully selected, it can be employed in carpenters' and wheelwrights' work. Pasture-animals of all kinds like to browse on the leaves, so that it is regarded as a "stand-by" in seasons of drought [A. R. Crawford]. Mr. Kirton observes, that a single tree of this species or of A. lanceolata will yield as much as two gallons of liquid kino at a time; nearly half of this consists of Kino-tannic acid; fishermen use it to tan their nets [J. H. Maiden]. A. lanceolata (Cavanilles) of the same geographic region is a closely allied species, but its timber is more close-grained, particularly hard and heavy. Flowers of all Angophoras much frequented by the honey-bee [Ch. French]. It is averred, that occasionally a watery fluid drops in dry weather from these trees, as a sign of the copious absorption of humidity [Edw. Martin].

Angophora subvelutina, F. v. Mueller.

Queensland and New South Wales. Attains a height of 100 feet. The wood is light and tough, soft while green, very hard when dry; used for wheel-naves, yokes, handles and various implements; it burns well, and contains a large proportion of potash [C. Hartmann]. Dr. Bancroft lauds the Kino as particularly effective in diarrhœa.

Anona Cherimolia, Miller.*

Ecuador to Peru. One of the "Custard-Apples." This shrub or tree might be tried in frostless forest-valleys, where humidity and rich soil will prove favorable to its growth. It is hardy in the mildest coast-regions of Spain, also in Chili. In Jamaica it is cultivated up to nearly 5000 feet [W. Fawcett]. Grows readily from seeds. It yields the Cherimoyer-fruit. The flowers are very fragrant. A. muricata L. (the Sour Sop), A. squamosa L. and A. sericea Dunal (the Sweet Sop) and A. reticulata (the Custard-Apple), all natives of the Antilles, can probably only under exceptionally favorable conditions be grown in any extra-tropic countries, though they produce fruits still in Florida. A. reticulata and A. squamosa produce just outside the tropics in East-Australia still heavy crops of fruit [Edgar], and may ripen also yet at Port Jackson [Fred. Turner]. These two are reared in Jamaica up to 3500 feet elevations [W. Fawcett].

Anthemis nobilis, Linné.

The true "Chamomile." Middle and Southern Europe, Northern Africa. A well-known medicinal plant, frequently also used as edgings for garden-plots. Flowers in their normal state are preferable for medicinal use to those in which the ray florets are produced in increased numbers. They contain a peculiar volatile oil and two acids, similar to angelic and valerianic acid. Hardy in Norway to lat. 63° 52′ [Schuebeler]. Use of the flowers therapeutically indicated in light nervous and spasmodic affections; they act also as a diuretic, and are renowned in popular medicine variously otherwise.

Anthemis tinctoria, Linné.

Middle and Southern Europe, Orient. An annual herb. The flowers contain a yellow dye.

Anthistiria avenacea, F. v. Mueller. (*Themeda avenacea, F. v. M.*)

Extra-tropical and Central Australia. A nutritious, perennial pasture-grass. Called by Mr. Bailey "one of the most productive grasses of Australia"; it produces a large amount of bottom-fodder, and it has also the advantage of being a prolific seeder, while it endures a hot, dry clime; grows to a height of over 6 feet. Mr. C. J. Macfarland considers it for pastoral purposes superior to the

ordinary Kangaroo-grass. It is nearest allied to A. gigantea Cavanilles (*Themeda gigantea*, Hackel) of Tropical Asia and Polynesia.

Anthistiria Australis, R. Brown. (*Themeda triandra* (Forskael).

The well-known "Kangaroo-grass," not confined to Australia, but stretching through Southern Asia also and through the whole of Africa; perennial, nutritious, comparatively hardy, ascending to sub-alpine elevations. In good seasons and in fair soil it will rise to over man's height. Chemical analysis of this grass during its spring-growth gave the following result:—Albumen, 2.05; gluten, 4.67; starch, 0.69; gum, 1.67; sugar, 3.06 per cent. [F. v. Mueller and L. Rummel]. Several species of Anthistiria occur variously dispersed from South-Africa to Japan, deserving introduction and naturalisation in countries of warm-temperate or tropical climates.

Anthistiria membranacea, Lindley. (*Themeda membranacea*, F. v. Mueller.)

Interior of Australia. Esteemed as fattening; seeds freely [Bailey]. Particularly fitted for dry, hot pastures, even of desert-regions, but never tall.

Anthoxanthum odoratum, Linné.

The "Scented Vernal-grass." Europe, Northern and Middle Asia, North-Africa. Found wild in Norway to lat. 71° 7′ [Schuebeler]. Perennial; not of great value as a fattening grass, yet always desired for the flavor, which it imparts to hay. Perhaps for this purpose the scented Andropogons might also serve. On deep and moist soils it attains its greatest perfection. It is much used for mixing among permanent grasses in pastures, where it will continue long in season, although it is also among the very early kinds out anywhere. Discarded as a pasture- or hay-grass by Professor Hackel; liked by many as an admixture to lawn-grasses. It would live well in any alpine region. Dr. Curl observes, that in New Zealand it grows all the winter, spring and autumn, and is a good feeding grass. The lamellar crystalline cumarin is the principle, on which the odor of Anthoxanthum depends.

Anthriscus Cerefolium, Hoffmann.

Europe and Western Asia. The "Chervil." An annual culinary plant; its herbage used as an aromatic condiment, but the root is seemingly deleterious. The plant requires in hot countries a shady situation [Vilmorin]; the foliage forms the principal ingredient of what in France is called "fines herbes." Can be cultivated in Norway as far north as 70° 22′ [Schuebeler].

Anthyllis vulneraria, Linné.

The Kidney-vetch. All Europe, Northern Africa, Western Asia. This perennial herb serves as sheep-fodder, and is particularly

recommended for calcareous soils. Comparable as regards nutrition next to Red Clover, but suitable also for sandy soil too poor for Red or White Clover; for pasture it lasts three or four years [Dr. Stebler]. It would also live in any alpine region. Indigenous in Norway as far north as lat. 70° [Schuebeler].

Apios tuberosa, Moench.

North-Eastern America. A climber with somewhat milky juice. The mealy tubers are edible.

Apium Chilense, Hooker and Arnott.

Western extra-tropic temperate America. A stouter plant than the ordinary celery, but of similar culinary use.

Apium graveolens, Linné.

The "Celery." Europe, Northern Africa, Northern and Middle Asia, North-Western America. Grows in Norway to lat. 70° [Schuebeler]. It is here merely inserted with a view of pointing out, that it might be readily naturalized anywhere on sea-shores. The wild plant is however by some considered unwholesome in a raw state. The fruitlets are occasionally utilized for condiment. Seed will keep for several years in cool climes, and it will ripen even in the hottest and driest regions of Australia under horticultural care. Much used by the ancients for wreaths.

Apium prostratum, La Billardière.

The Australian celery. Extra-tropical Australia, New Zealand, Extra-tropical South-America. This also can be utilized as a culinary vegetable, but not in a raw state.

Apocynum cannabinum, Linné.

North-America. Locally known as "Indian Hemp." A perennial herb. This is recorded among plants yielding a textile fibre. A. androsæmifolium (Linné) yields medicinally the "Bitter Root" of the United States, that of A. cannabinum being likewise medicinally valuable. Both plants bear the clime to 60° N. lat. in Norway [Prof. Schuebeler]. The therapeutic value depends on the Apocynin, a potent diaphoretic solvent and laxative, also as an eliminator, particularly advocated in hydrops, employed also in gout.

Aponogeton crispus, Thunberg.

From India to New South Wales. The tuberous roots of this water-herb are amylaceous and of excellent taste, though not large. The same remarks apply to A. monostachyos (Linné fil.) and several other species, all from the warmer regions of the Eastern hemisphere.

Aponogeton distachyos, Thunberg.

South-Africa. This curious water-plant might be naturalised in ditches, swamps and lakes, for the sake of its edible tubers. The scented flowering portion of this plant affords spinage. For a full account see Paillieux and Bois in "Bulletin de la Société d'Acclimatation," 1888, pp. 782-786.

Aquilaria Agallocha, Roxburgh.

Silhet and Assam. A tree of immense size. It furnishes the fragrant calambac- or agallochum-wood, known also as aggur or tuggur or the aloe-wood of commerce, famed since ancient times. The odorous portion is only partially distributed through the stem. This wood is also of medicinal value.

Arachis hypogæa, Linné.*

Peru and Brazil. The "Earth-nut, Pea-nut or Ground-nut." The seeds of this annual herb are consumed in a roasted state, or used for the expression of a palatable oil, which does not readily become rancid, the percentage ranging to 45. Where an oil-mill is not accessible, the seeds, shelled out, could be pounded and put into a cauldron of boiling water, when the oil will rise to the surface and could easily be skimmed off, the residue serving as a fattening food for fowls [R. L. Holmes]. The import of this fruit into Victoria during 1887 was 2,166 centals, valued at £2,129. The plant is a very productive one, and yields a very quick return. It ranks also as a valuable fodder-herb; the hay is very nutritious, much increasing the milk of cows. A light somewhat calcareous soil is best fitted for its growth. On such soil 50 bushels may be obtained from the acre, but Mr. Bernays notes the return up to 120 bushels, the weight of which ranges from 25 to 32 lbs. Mr. Holtze harvested at Port Darwin 27 cwt. from an acre, the product being saleable at £20 per ton there. In 1880 the peanut-crop in the Southern United States came to 2,820,000 bushels, representing a value of £517,000. Professor Wittmack obtained fruits from ancient graves of Ancon.

Aralia cordata, Thunberg. (*A. edulis,* Siebold).

Japan. A perennial herb. The young shoots and foliage provide an excellent culinary vegetable there.

Aralia Ginseng, Decaisne and Planchon. (*Panax Ginseng,* Meyer.)

China and Upper India, ascending to 12,000 feet. This herb furnishes the celebrated Ginseng-root, so much esteemed as a stimulant by the Chinese, the value of which however may be overrated. The root, to be particularly powerful, needs probably to be obtained from high mountain-elevations. The species is closely related to the North-American A. quinquefolia (Decaisne and Planchon).

Araucaria Bidwilli, Hooker.*

Queensland. Bunya-Bunya. A tree, attaining 250 feet in height, with a fine-grained, hard and durable wood, particularly valuable for furniture; it shows its beautiful streaks best when polished. The seeds are large and edible. Growth in height at Port Phillip 30-40 feet in 20 years, the big strobiles ripening there.

Auraucaria Brasiliensis, A. Richard.*

Southern Brazil. A tree to 180 feet high, producing edible seeds. Dr. Saldanha da Gama reports, that the wood makes splendid boards, masts and spars, and that the tree also yields a good deal of turpentine. Except a few palms (Mauritia, Attalea, Copernicia), this seems the only tree, which in Tropical South-America forms forests by itself [Martius].

Araucaria Cookii, R. Brown.

New Caledonia and New Hebrides. Height of tree to 200 feet. Technical value similar to that of A. excelsa, habit more columnar. Growth at Port Phillip not quite 30 feet in 20 years.

Araucaria Cunninghami, Aiton.*

"Moreton-Bay Pine." Eastern Australia, between 14° and 32° south latitude, extending also to the highlands of New Guinea. The tree attains a height of 200 feet, with a trunk 6 feet in diameter. Growth in height at Port Phillip 30 to 40 feet in 20 years. The timber is fine-grained, strong and durable, if not exposed to alternately dry and wet influences; it is susceptible of a high polish, and thus competes with satin-wood, and in some respects with birdseye-maple. Value in Brisbane, £2 15s. to £3 10s. per 1,000 superficial feet. The tree grows on alluvial banks as well as on rugged mountains, overtopping all other trees. The resin, which exudes from it, has almost the transparency and whiteness of crystal, and is often pendent in the shape of icicles, which are sometimes 3 feet long and 6 to 12 inches broad [W. Hill]. Araucarias should be planted by the million in fever-regious of tropical countries for hygienic purposes, on account of their antiseptic exhalations.

Araucaria excelsa, R. Brown.*

"Norfolk-Island Pine." A magnificent tree of unsurpassed symmetry, sometimes 220 feet high, with a stem attaining 10 feet in diameter, and with regular tiers of absolutely horizontal branches, one for each year. The timber is useful for ship-building and many other purposes. Growth in height at Port Phillip about 40 feet in 20 years. With A. Cunninghami amenable to almost any soil, except a saline one, and not subject to any disease. Endures also the vicissitudes of the clime of Lower Egypt. Resists sea-

breezes to a remarkable degree. Ceases to be hardy in the south of New Zealand.

Araucaria imbricata, Pavon.*

Chili and Patagonia. The male tree attains generally a lesser height than the female, which reaches 150 feet. At Brest it attained 72 feet in 55 years [de Kersanton]. This species furnishes a hard and durable timber, as well as an abundance of edible seeds, which constitute a main-article of food of the natives. Eighteen good trees will yield enough of vegetable food for a man's sustenance all the year round. The wood is yellowish-white, full of beautiful streaks, capable of being polished and worked with facility. It is admirably adapted for ship-building. The resin is pale and smells like frankincense [Lawson]. The tree is most frequently found on rocky eminences almost destitute of water [J. Hoopes]. It is hardier than any other congener, having withstood the frosts of Norway up to latitude 61° 15′ [Schuebeler]. Endures also the clime in many parts of Scotland. Grows more slowly in Australia than the native species.

Araucaria Rulei, F. v. Mueller.

New Caledonia. A magnificent tree, with large shining leaves; doubtless not merely of decorative but also of utilitarian value. A closely allied species, A. Muelleri, comes with A. Balansæ and A. montana (Brogniart) from the same island, A. Hunsteinii (Schumann), from Northern New Guinea.

Araujа albens, D. Don.

Southern Brazil. This plant proved hardy at Toulouse. The fibre of the bast is tough and of a silky softness [Dr. Clos].

Arbutus Menziesii, Pursh.

North-Western America. An evergreen tree, attaining a height of 150 feet, with a stem reaching 8 feet in diameter. It is of comparatively quick growth [Dr. Gibbons]; it belongs to the coast-tract exclusively. Wood exceedingly hard, not apt to rend, splendid for furniture. The tree requires a deep loamy soil [Bolander], and is fit only for shady, irrigated woodlands; likes the company of Pinus Douglasii and of Sequoias. It would be valuable at least as a highly ornamental garden- or park-plant, being the tallest among about a thousand Ericeæ of the world.

Archangelica officinalis, Hoffmann.

Arctic zone and mountain-regions of many parts of Europe. The young shoots and leaf-stalks of this biennial herb are used for Angelica-confectionery; the roots are of medicinal use, and likewise they are chosen as well as the fruitlets for the distillation of some cordials. They promote digestion, and stimulate the mucous

membranes into increased secretions. Hardy in Norway to lat. 71° 10′ [Schuebeler]. In any sub-alpine regions this plant would particularly establish its value. The surprisingly gigantic Angelica ursina (Regel; Angelophyllum ursinum, Ruprecht) forms a conspicuous feature in the landscape of Kamtschatka and Sachalin. It is delineated on plate XVI. of Lindley and Moore's Treasury of Botany; it ought to become an important plant for annual scenic culture.

Arctostaphylos uva ursi, Adanson.

Europe, Northern Asia and North-America, in colder regions, extending to the arctics. A medicinal small shrub, which could best be reared in the heath-moors of alpine tracts. Long known as a powerful diuretic. Valuable also as a honey-yielding plant [Cook].

Arenga saccharifera, La Billardière.

India, Cochinchina, Philippines and, according to Doederlein, also most Southern Japan. This Palm attains a height of 40 feet. The black fibres of the leaf-stalks are adapted for cables and ropes, intended to resist wet very long. The juice convertible into toddy or sugar; the young kernels made with syrup into preserves. This Palm dies off as soon as it has produced its fruit; the stem then becomes hollow, and can be used for spouts and troughs of great durability. The pith supplies sago, about 150 lbs. from a tree, according to Roxburgh. Hardier than Cocos nucifera.

Argania Sideroxylon, Roemer and Schultes.

Western Barbary, on dry hills. "The Argan-tree." Its growth is generally slow, but it is a long-lived tree. Though comparatively low in stature, its foliage occasionally spreads to a circumference of 220 feet. It sends out suckers from the root. The fruit serves as food for cattle in Morocco; but in Australia the kernels would be more likely to be utilised by pressing an oil from them. Height of tree exceptionally 70 feet. Produces fruit also in the clime of Tasmania [Abbott]. Commences to bear fruit when about 6 years old [C. Moore], and thence bears regularly and has more or less fruits on it throughout the year. Dryander gave already a scientific account of this tree in the transactions of the Linnean Society, II., 225.

Aristida prodigiosa, Welwitsch.*

Angola, on the driest sand-hills. A perennial fodder-grass, of which the discover speaks in glowing terms of praise. In the West-African desert-country, in places devoid of almost all other vegetation, the zebras, antelopes and hares resort with avidity to this grass; it also affords there in the dry season almost the only fodder for domestic grazing animals. Moreover, this seems to indicate, that the closely cognate A. plumosa, L. and A. ciliata,

Desf., of the countries at or near the Mediterranean Sea, might likewise be encouraged in their natural growth or be cultivated. All feathery grasses are among the most lovely for minor decorative purposes or designs, and this may also be said of the Australian plumous Stipa elegantissima (La Billardière) and S. Tuckeri (F. v. M.).

Aristida pungens, Desfontaines.

Northern and Central Africa. Constitutes the principal native fodder-grass of the Sahara, being content with sand-soil. This perennial tall grass is lauded as one of the most nutritive and widely-spread there [Brockhaus].

Aristolochia Indica, Linné.

Tropical Asia, North-Eastern Australia and Polynesia. A perennial climber; the leaves famed as an alexipharmic. Can only be grown in places free from frost.

Aristolochia recurvilabra, Hance.

The green "Putchuck" of China. A medicinal plant, largely obtained at Ningpo. The present value of its local export is from £20,000 to £30,000 annually.

Aristolochia serpentaria, Linné.

The "Snake-root." South-Eastern States of North America. The root of this trailing herb is valuable in medicine; it contains a peculiar volatile oil. Therapeutically the plant belongs to the aromatic-bitter restorative agents, and is particularly a tonic excitant. Several other Aristolochiæ deserve culture for medicinal purposes,—for instance, Aristolochia ovalifolia (the Guaco) and A. anguicida, from the mountains of Central America.

Aristotelia Macqui, L'Héritier.

Chili. The berries of this shrub, though small, have the pleasant taste of bilberries, and are largely consumed in Chili [Philippi]. The plant would thrive in mild forest-valleys. It is quite hardy in South-Ireland.

Arnica montana, Linné.

Colder parts of Europe and Western Asia. This pretty herb is perennial and of medicinal value. It is particularly eligible for sub-alpine regions. Hardy in Norway to lat. 62° 47′ [Schuebeler]. The active principles are arnicin, a volatile oil, caproic and caprylic acids. Snuff can be prepared from this plant. The flowers can only in small quantities be used, as incautious doses of this medicine produce toxic symptoms; it stimulates the salivary glands, promotes the circulation, cerebral, cutaneous and renal action. Externally applied as an excitant.

Arracacha xanthorrhiza, Bancroft.

Mountain-regions of Central America. A perennial umbelliferous herb. The root is nutritious and palatable. There are yellow, purple and pale varieties, which are kept up by division of the roots.

Artemisia Abrotanum, Linné.

Countries at the Mediterranean Sea. A very odorous shrub, known as "Southern Wood." The foliage used in domestic medicine, also as condiment. The plant is easily grown from cuttings.

Artemisia Absinthium, Linné.

Europe, North- and Middle-Asia and North-Africa. The "Wormwood." A perennial herb, valuable as a tonic and anthelminthic. Should be avoided, where bees are kept [Muenter], although an absinthine honey might be used medicinally. Indigenous in Norway to lat. 63° 28′ north, but cultivated quite to 70° [Prof. Schuebeler]. Recommended for cultivation as a preventative of various insect-plagues, even the Phylloxera. Several other species of Artemisia deserve cultivation for medicinal purposes. Active principles: Absinthin, an oily substance indurating to a crystalline mass; also a volatile oil peculiar to the species.

Artemisia Cina, Berg.

Kurdistan. This herb furnishes the genuine santonica-seeds (or rather flowers and fruits), a vermifuge of long-established use. Some other Asiatic species yield a similar drug, which should only consist of young headlets of flowers; the chemical principle Santonin is obtained from them.

Artemisia Dracunculus, Linné.

Northern Asia. The "Tarragon" or "Estragon." A perennial herb, used as a condiment. Its flavor depends on two volatile oils, one of them peculiar to the plant. Hardy in Norway to lat. 63° 52′ [Schuebeler]. Propagation by division of root. The wild plant has but little flavor [Vilmorin].

Artemisia Mutellina, Villars.

Alps of Europe. This aromatic, somewhat woody plant deserves to be established in any alpine region. This species and A. glacialis, L., A. rupestris, L. and A. spicata, Wulf., comprised under the name of "Genippi," serve for the preparation of the Extrait d'Absinthe [Brockhaus].

Artemisia Pontica, Linné.

Middle and Southern Europe, Western Asia. More aromatic and less bitter than the ordinary wormwood. Hardy to lat. 63° 45′ in

Norway [Schuebeler]. Many other species of this genus deserve attention of the culturist.

Artocarpus communis, R. and G. Forster.* (*A. incisa*, Linné fil.)

South-Sea-Islands, Moluccas and Sunda-Islands.

The Tahiti "Breadfruit-tree." It stretches in the Sandwich-Islands through cultivation almost beyond the tropics, ripening fruit also in Florida, and ascending to 3,000 feet in Jamaica. Dies still down in unusually cool seasons at the tropic of Capricorn in East Australia, when in a young state, unless protected during the coldest weather. According to Dr. Seemann's excellent account seedless varieties exist, and others with entire leaves and with smooth and variously shaped and sized fruits; others again ripening earlier, others later, so that ripe bread-fruit is obtainable more or less abundantly throughout the year. The fruit is simply boiled or baked or converted into more complicated kinds of food. Starch is obtainable from the bread-fruit very copiously. The very fibrous bark can be beaten into a sort of rough cloth. The light wood serves for canoes. The exudation, issuing from cuts, made into the stem, is in use for closing the seams of canoes, and could be turned to technic account.

Artocarpus integrifolia, Linné fil.*

India. The famous "Jack-Tree," ascending like the allied A. Lakoocha (Roxburgh) to 4,000 feet; only fit for places free of frost. A large tree in full bearing is one of the grandest of objects in the whole vegetation of the world. The fruit attains exceptionally a weight of 80 lbs.; it is eaten raw or variously prepared; the seeds, when roasted, are not inferior to chestnuts [Dr. Roxburgh]. In East-Australia just outside the tropics this tree still produces fruits in enormous quantity, up to a weight of 23 lbs. [Edgar]; to a lesser extent at Moreton-Bay [Fr. Turner]. Bears fruit as far south as Durban in Natal [J. M. Wood]. In Jamaica it is cultivated up to 3,000 feet [W. Fawcett]. The allied A. polyphema (Persoon) has smaller fruits, very odorous and with sweet pulp. It is a native of Cochinchina; its degree of hardiness is not well ascertained yet. An illustration of it occurs in Madame van Nooten's beautiful work on Javanese culture-plants.

Arundinaria elegans, Kurz.

Burma, ascending to 7,000 feet elevation. Height of stems to 20 feet.

Arundinaria falcata, Nees.

Middle Himalayan zone, ceasing at elevations over 7,000 feet. The canes are thin and weak, seldom over six feet high. This bamboo does not necessarily require moisture. In reference to various bamboos see the Gardeners' Chronicle of December, 1876,

also the Bulletin de la Société d'Acclimation de Paris, 1888. The closely allied Jurboota-Bamboo of Nepal, which occurs only in the cold altitudes of from 7,000 to 10,000 feet, differs in its solitary stems, not growing in clumps. The Thamor-Kaptur-Bamboo is from a still colder zone, at from 8,500 to 11,500 feet, only 500 feet or less below the lower limits of perpetual glaciers [Major Madden]. The wide and easy cultural distribution of bamboos by means of seeds has been first urged and to some extent initiated by the writer of the present work. Refer for the above also to A. spathiflora.

Arundinaria Falconeri, Munro. (*Thamnocalamus Falconeri,* J. Hooker.)

Himalaya, at about 8,000 feet elevation. A tall species with a panicle of several feet in length. Allied to the foregoing species.

Arundinaria Hookeriana, Munro.

Himalaya, up to nearly 7,000 feet. Grows to a height of about 15 feet. Vernacularly known as "Yoksun" and "Praong." The seeds are edible, and also used for a kind of beer [Sir Jos. Hooker]. Grains of most kinds of Bamboos are however only produced at long intervals, nor do they retain vitality for a long time.

Arundinaria Japonica, Siebold and Zuccarini.

The "Metake" of Japan. Attains a height of from 6 to 12 feet. Uninjured by even severe winters at Edinburgh. with 0° F. [Gorlie].

Arundinaria macrosperma, Michaux and Richard.

Southern States of North-America, particularly on the Mississippi. This bamboo-like reed forms there the cane-brakes. Fit for low borders of watercourses and swamps. According to C. Mohr it affords throughout all seasons of the year an abundance of nutritious fodder. It requires to be replanted after flowering, in the course of years. Height reaching 20 feet.

Arundinaria spathiflora, Trinius.*

"The Ringal." Himalaya, at elevations of 8,000 to 10,000 feet, growing among firs and oaks in a climate almost as severe as that of England, snow being on the ground from 2 to 3 months. Stems rise to 30 feet; more than a hundred may in the course of a year spring from one root; the canes of this species are quite celebrated for water-tubes, fishing-rods and various implements, also as material for mats and baskets [Sir D. Brandis, in proceed. R. Soc. of New South Wales, 1885].

Arundinaria tecta, Muehlenberg.

Southern States of North-America. A cane, growing 10 feet high. Prefers good soil, not subject to inundations; ripens its

large mealy seeds early in the season, throwing out subsequently new branches with rich foliage. Fire destroys this plant readily [C. Mohr].

Arundinaria Veitchii, N. E. Brown.

Japan and even northward beyond Sachalin-Island. Concerning this very hardy Bamboo information is extant in the Gardeners' Chronicle of 1889, p. 521. Eldest name, A. kurilensis [Rupr].

Arundinella Nepalensis, Trinius.

Middle and Southern Africa, Southern Asia, Northern and Eastern Australia. This grass commences its growth in the spring weather, and continues to increase during the whole summer, forming a dense mass of foliage, which grows as fast as it is fed off or cut. In New Zealand it is only a summer-grass, but valuable for its rapid growth at that season and for thriving on high dry land [Dr. Curl].

Arundo Ampelodesmos, Cyrillo.

Southern Europe, Northern Africa. Almost as large as a Gynerium. The tough flower-stems and leaves readily available for tying.

Arundo Bengalensis, Roxburgh.

China, India. Closely allied to A. Donax. The long panicle beautifully variegated with white and violet [Hance].

Arundo conspicua, G. Forster.

New Zealand and Chatham-Islands. Although not strictly an industrial plant, it is mentioned here as important for scenic effect, flowering before the still grander A. Sellowiana comes in bloom, but not quite so hardy as that species, still bearing considerable frost. The leaves serve for rough forage, particularly those of a more succulent variety [J. Buchanan].

Arundo Donax, Linné.*

The tall, evergreen, lasting Bamboo-reed of Southern Europe, South-Western Asia and Northern Africa. It is one of the most important plants of its class for quickly producing scenic effect in picturesque plantations, also for intercepting almost at once the view of unsightly objects, and for giving early shelter; attains occasionally a height of 30 feet. Comparatively hardy. The canes can be used for fishing-rods, for light props, rustic pipes, distaffs, baskets and various utensils. Readily flowering when strongly manured. The root is used medicinally in France. Easily transplanted at any season. Cross-sections of the canes are very convenient, placed closely and erect, for sowing into them seeds of pines, eucalypts and many other trees, seedlings of which are to be

forwarded on a large scale to long distances [J. E. Brown], in the same manner as bamboo-joints are used in India, Rows or belts of it intercept sewage or exsiccate stagnant drainage. The roots can readily be carried by tourists; landscapes might thus far be embellished. Pasture-animals like to browse on the young foliage. Dr. Bancroft proved this plant a splendid "stay-by" in seasons of drought, and recommends reserve-fields of it regularly to be kept.

Arundo Karka, Roxburgh.

India, China, Japan. The Durma-mats are made of the split stems of this tall reed.

Arundo Pliniana, Turra.

On the Mediterranean and Adriatic Seas, A smaller plant than A. Donax, with more slender stems and narrower leaves, but similarly evergreen, and resembling the Donax-reed also in other respects.

Arundo saccharoides, Grisebach. (*Gynerium saccharoides*, Humboldt.)

Northern parts of South-America. Attaining a height of 20 feet. Like the following, it is conspicuously magnificent.

Arundo Sellowiana, Schultes.* (*Arundo dioica*, Sprengel *non* Loureiro, *Gynerium argenteum*, Nees.)

The "Pampas-grass" of Uruguay, Paraguay and La Plata-States. A grand autumnal-flowering reed, with gorgeous feathery panicles. As an industrial plant it deserves here a place, because paper can be prepared from its leaves, as first shown by the author.

Asimina triloba, Dunal.

South-Eastern States of North-America, extending to New York. A small tree; the comparatively large pulpy fruit is of pleasant odor and of sweet taste, and when well ripened it is edible. Prof. Naudin thinks that by selection from carefully cultivated plants the fruit would much improve.

Asparagus acutifolius, Linné.

In all the countries around the Mediterranean Sea, also in the Canary-Islands. Although a shrubby Asparagus, yet the root-shoots, according to Dr. Heldreich, are collected in Greece, and are tender and of excellent taste, though somewhat thinner than those of the ordinary herbaceous species; in Istria and Dalmatia they are consumed as a favorite salad. The shrub grows on stony rises, and the shoots are obtained without cultivation. A. aphyllus, L. and A. horridus, L., according to Dr. Reinhold, are utilised in the same manner, and all may probably yield an improved product by lar and careful culture.

Asparagus albus, Linné.

Countries around the Mediterrrean Sea, also in the Canary-Islands. Serves for garden-hedges.

Asparagus laricinus, Burcheli.

South-Africa. Dr. Pappe observes of this shrubby species, that with some other kinds of that country it produces shoots of excellent tenderness and aromatic taste.

Asparagus officinalis, Linné.*

Europe, North-Africa, West-Asia. The well-known Asparagus-plant, which, if naturalized on any coast, would aid in binding the sand. Hardy in Norway to lat. 64° 12′ [Schuebeler]. The plant contains Vanillin, the foliage inosit-sugar, the shoots yield asparagin. Sea-weeds are a good additional material for forcing asparagus. Can for culinary purposes even be grown in sub-tropical climes. The seeds will keep five years or even longer. Important as a food to promote renal secretions, also against dropsy, vesical torpidity and even various cutaneous affections.

Asparagus tenuifolius, Lamarck.

South-Europe and South-Western Asia. Foliage in great demand for bouquets on account of its almost transparent "quivering sprays," which keep fresh for days.

Asperula odorata, Linné.

The "Woodruff." Europe, Western and Northern Asia, Northern Africa, there as in Southern Europe only on mountains, always a forest-plant. Indigenous in Norway to lat. 66° 59′ [Schuebeler]. A perennial herb with highly fragrant flowers; it deserves naturalisation in forests; it contains much cumarin in its flowers, and serves in Germany for preparing the "Maitrank." Therapeutically the plant belongs to the Secretatories, and is a domestic remedy in hydropic and some other affections.

Aspidosperma Quebracho, Grisebach.

Argentina. Shrub or tree, even tall, with wood fit for xylography. The bitter bark is astringent and febrifugal [Lorentz], being almost as rich in tannin as that of Piptadenia Cebil. The leaves even contain up to 27½ per cent.; both have the advantage of producing an almost colorless leather [Sievert]. F. Jean states, that even the Quebracho-wood contains 14 to 16 per cent. of tannic and 2 to 3 per cent. of gallic acid.

Astartea fascicularis, De Candolle.

South-Western Australia. A tall shrub or small tree, with a predilection for swampy ground, rather remarkable for quick growth, and evidently destined to take its place in antimalarian plantations. The foliage is locally used for tea.

Astragalus adscendens, Boissier and Haussknecht.

Persia, in alpine elevations of 9,000 to 10,000 feet. A shrub, attaining a height of 4 feet. Yields gum-tragacanth in abundance [Haussknecht]. Many species of this genus, numerous in various parts of Europe and Asia, in California and in some other parts of the globe, deserve attention for pastural and other agronomic purposes. Tragacanth is preferentially used, to give gloss to calico, also much in confectionery.

Astragalus arenarius, Linné.

Europe and Western Asia. A perennial fodder-herb for any sandy desert country.

Astragalus brachycalyx, Fischer.

Kurdistan. A low shrub, affording gum-tragacanth [Flueckiger].

Astragalus Cephalonicus, Fischer. (*A. aristatus,* Sibthorp.)

Cephalonia. A small shrub, yielding a good tragacanth; and so probably also does the true A. aristatus of l'Héritier.

Astragalus Cicer, Linné.

Middle and Southern Europe and Middle Asia. A nutritious perennial herb, much sought by grazing animals. It requires, according to Langethal, deep friable grounds and, like most leguminous herbs, calcareous ingredients in the soil.

Astragalus Creticus, Lamarck.

Candia and Greece. A small bush, exuding the ordinary vermicular tragacanth; the pale is preferable to the brown sort.

Astragalus glycyphyllos, Linné.

Europe and Northern Asia. Succeeds on light soil, also in forest-regions. It has been recommended as a perennial, substantial fodder-plant, which on cow-pastures particularly increases the yield of milk. Hardy as far as 61° 24′ north lat. in Norway [Schuebeler].

Astragalus gummifer, La Billardière.

Syria and Persia. This shrub also yields a good kind of tragacanth.

Astragalus hypoglottis, Linné. (*A. Danicus,* Retzius.)

Colder regions of Europe, Asia and North-America. This perennial plant is regarded as a good fodder-herb on calcareous and gravelly soil, and would likely be of importance in any alpine region. Of the enormous number of supposed species of this genus (according to Bossier, not less than 750 merely in Asia Minor and the adjoining countries) many must be of value for pasture, like some of the closely-allied Australian Swainsonas, though they also

may include deleterious species ; thus A. Hornii and A. lentiginosus (Gray) of California, and A. mollissimus (Nuttall) of Texas, are known as loco-weeds, and are poisonous to cattle and horses, just as Swainsona lessertifolia (Candolle) and S. Greyana (Lindley) have shown themselves highly injurious to pasture animals in Australia; the active principle of these plants may however become of importance in medicine.

Astragalus Hyrcanus, Pallas.

From the Caspian Sea to Afghanistan, in sandland. This shrub is locally valuable for the sustenance of pasture-animals [Dr. J. Aitchison].

Astragalus microcephalus, Willdenow.

From Turkey to Russian Armenia. Gum-tragacanth is collected largely also from this species [Farnsworth] and from the nearly allied A. pycnocladus (Boissier and Haussknecht).

Astragalus Parnassi, Boissier. (*A. Cylleneus,* Heldreich,)

Greece. This small shrub furnishes there almost exclusively the commercial tragacanth. It ascends to elevations of 7,000 feet, becoming therefore alpine.

Astragalus strobiliferus, Royle.

Asiatic Turkey. A brown tragacanth is collected from this species.

Astragalus stromatodes, Bunge.

Syria. At elevations of approximately 5,000 feet. Exudes Aintab-tragacanth, which is also obtained from A. Kurdicus (Boissier).

Astragalus venosus, Hochstetter.

From Abyssinia to Central Africa. This perennial herb is subjected to regular cultivation for fodder, known as "Hamat-Kochata" [D. Oliver.]

Astragalus verus, Olivier.

Asiatic Turkey and Persia. This shrub furnishes the Takalor- or Smyrna-tragacanth, or it is derived from an allied species. From an Astragalus of S.W. Asia is obtained the Sarcocolla-gum [Dr. Dymock.]

Astrebla pectinata, F. v. Mueller.* *Danthonia pectinata,* Lindley.

New South Wales, Queensland, Northern and Central Australia, in arid regions, always inland. A perennial desert-grass, resisting drought ; sought with avidity by sheep, and very fattening to them and other pasture-animals. Seeding freely.

Astrebla triticoides, F. v. Mueller.* (*Danthonia triticoides,* Lindley.)

The "Mitchell-grass." Of nearly the same natural distribution as the preceding, and equalling that species in value. Both so important as to deserve artificial rearing even in their native country.

Atalantia glauca, J. Hooker.

New South Wales and Queensland. This Desert-lemon is mentioned here, to draw attention to the likelihood of its improving in culture, and to its fitness for being grown in arid climes.

Atriplex Capense, Moquin.

South-Africa. There a valuable salt-bush of pastures [Prof. McOwan].

Atriplex cinereum, Poiret.

From Eastern to Western Australia, along the extra-tropical coast. A rather tall and bulky salt-bush, which supplies good fodder for cattle, according to Mr. F. Turner.

Atriplex crystallinum, J. Hooker.

South-Eastern Australia and Tasmania, on the brink of the ocean and exposed to its spray. This herb vegetates solely in salty coast-sands, which it helps to bind, like Cakile. In a special volume, now under preparation, all the Australian Salsolaceæ will be lithographically illustrated, with a view that the selected kinds may be easily recognised for further pastoral distribution.

Atriplex halimoides, Lindley.*

Gregarious over the greater part of the saline desert-interior of Australia, reaching the South- and West-coasts. One of the best dwarf species for salt-bush pastures. All such plants are readily raised from seeds. Should even in its native places with other valuable species be redisseminated methodically.

Atriplex hortense, Dodoens.

Northern and Middle Asia. The "Arroche." An annual spinnage plant. Hardy in Norway to lat. 70° [Schuebeler]. Seeds mature well, and will keep fully six years [Vilmorin].

Atriplex leptocarpum, F. v. Mueller.

East-Australia. This is another of the perennial salt-bushes which render many of our dry and sterile tracts valuable for sheep pastures. It will bear a great amount of drought, and if not too closely fed down, produce seeds in abundance.

Atriplex Muelleri, Bentham.

Interior of Australia, reaching the South- and West-coasts. Cattle and especially sheep are so fond of it, that they often browse it to the root. This species approaches in its characteristics closely to A. roseum (Linné) from Europe, North-Africa and Western Asia; which thus perhaps may be of greater rural significance also, than hitherto supposed.

Atriplex nummularium, Lindley.*

From Queensland through the desert-tracts to Victoria and South-Australia. One of the tallest, most fattening and wholesome of Australian pastoral salt-bushes, but not so much relished by grazing animals as some of the smaller species. Sheep and cattle, pastured on salt-bush country, are said to remain not only free from fluke, but to recover from this Distoma-disease and other allied ailments.

Atriplex semibaccatum, R. Brown.

Extra-tropic Australia. A perennial herb, very much liked by sheep [R. H. Andrews], thus considered among the best of saline herbage of the salt-bush country. Mr. Will. Farrer pronounces this herb as wonderful for its productiveness and its drought-resisting power.

Atriplex spongiosum, F. v. Mueller.*

Through a great part of Central Australia, extending to the South- and West-coast. Available, like the preceding and several other species, for salt-bush culture of particular nutritiveness. Unquestionably some of the shrubby extra-Australian species, particularly those of the Siberian and Californian steppes, could also be transferred advantageously to subsaline country elsewhere, to increase its value, particularly for sheep-pasture.

Atriplex stipitatum, Bentham.

Interior of South-Eastern Australia. Considered a good kind among dwarf salt-bushes for pastoral purposes [Duncan Love]. A. velutinellum (F. v. M.), of South Australia and New South Wales, is another valuable species, according to Mr. F. Turner. Mr. W. A. Dixon found 92 per cent. of digestible substances in the allied A. angulatum.

Atriplex vesicarium, Heward.*

In the interior of South-Eastern and in Central Australia. One of the most fattening and most relished of all the dwarf pastoral salt-bushes of Australia, holding out in the utmost extremes of drought, and not scorched even by sirocco-like blasts. Its vast abundance over extensive salt-bush plains of the Australian interior, to the exclusion of almost every other bush except A. halimoides, indicates

the facility with which this species disseminates itself. Splendid wool is produced in regions where A. vesicarium and A. halimoides almost monopolize the ground for enormous stretches. With other woody species easily multiplied from cuttings also; but, as remarked by Naudin, producing thousands of fruits in less than three months after sowing, and, as stated by Millardet, has become the marvel of the Delta of the Rhone.

Atropa Belladonna, Linné.

The "Deadly Nightshade." Southern and Middle Europe and Western Asia. A most important perennial medicinal herb. The highly powerful atropin is derived from it, besides another alkaloid, the belladonnin. The action of belladonna is mydriatic, thus of great moment in opthalmic surgery. The effect in other respects is very complicated and heroic. Speaking briefly, it is a narcotic of first rank; amongst its uses are those against asthma, various spasms, epilepsy; but the whole range of its efficacy cannot be discussed in pages like these. It is an antidote to various vegetable poisons.

Audibertia polystachya, Bentham.

California. A shrub, attaining a height of 10 feet; keeps the bees buzzing with activity about its flowers for honey during the whole spring [A. J. Cook]. The same can be said of A. Palmeri (Gray) and some other species.

Avena elatior, Linné.* (*Arrhenatherum elatius,* Beauvois.)

The tall Meadow-Oatgrass. Europe, Middle Asia, North-Africa. Indigenous in Norway to lat. 68° 11' [Schuebeler]. This grass should not be passed altogether on this occasion, although it becomes easily irrepressible on account of its wide-creeping roots. It should be chosen for dry and barren tracts of country, having proved through its deeply penetrating roots to resist occasional droughts better than rye-grass. Hon. J. L. Dow regards it as one of the very best of grasses for sandy soil. Yields more green feed in the Southern States of North-America during winter than most other grasses [Loring]. The bulk yielded by it is great; it submits well to depasturing, and gives two or three crops of hay annually – thus, a total up to 80 cwt. [Stebler]. It is, however, not so much relished by animals as many other grasses, and should never be sown by itself.

Avena fatua, Linné.

Wild Oats. Europe, Northern Africa, Northern and Middle Asia, eastward as far as Japan. The experiments of Professor Buckman seem to indicate, that our ordinary cultivated Oat (Avena sativa, L.) is descended from this plant. Cultivated in California for fodder, but requiring early cutting, as it matures and sheds its

seeds in July. For this reason it is also hard to exterminate it in grain-fields, where it sometimes proves quite troublesome, unless by change of crops.

Avena flavescens, Linné. (*Trisetum flavescens,* Beauvois.)

Yellowish Oat-grass. Europe, Northern Africa, Middle and Northern Asia, eastward as far as Japan. One of the best of perennial meadow-grasses, living on dry soil; fitted also for alpine regions. Lawson observes that it yields a considerable bulk of fine foliage, and that it is eagerly sought by sheep, but that it thrives best intermixed with other grasses. It likes particularly limestone soil, where it forms a most valuable undergrass, but is not adapted for poor sand, nor will it stand well the traversing of grazing animals [Langethal]. It is richer in potash than many other grasses [Stebler].

Avena pratensis, Linné.

Meadow-Oatgrass. Europe, Northern Asia. Indigenous in Norway to lat. 66° 40′ [Schuebeler]. It thrives well on dry clayey soil, is well adapted also for alpine mountains, where it would readily establish itself, even on heathy moors. It produces a sweet fodder, but not in so great quantity as several other less nutritious grasses. It is perennial, and recommended by Langethal for such ground as contains some lime, being thus as valuable as Festuca ovina. Eligible also for meadows, especially under a system of irrigation.

Avena pubescens, Linné.

Downy Oat-grass. Europe, Northern and Middle Asia. A sweet perennial grass, requiring dry but good soil containing lime; it is nutritious and prolific, and one of the earliest kinds, but not well resisting traffic. Several good Oat-grasses are peculiar to North-America and other parts of the globe. The relative value for fodder is in many cases not exactly known, nor does the limit assigned to this volume allow of their being enumerated specially.

Avena sativa, Linné.*

The Common Oats. In Middle Europe cultivated before the Christian era and in Switzerland already at the Bronze-age. A. de Condolle regards it as probably indigenous to Eastern temperate Europe, particularly the Austrian Empire, thence perhaps extending to Siberia. Prof. Haussknecht, on linguistic researches, favors the idea, that the A. sativa was gradually derived from A. fatua (Linné), the Wild Oats of Europe and Northern Asia. Annual. Important for fodder, green or as grain—for the latter indispensable. Fit for even poor or moory or recently drained land, though not so well adapted for sandy soil as rye, nor well available for calcareous ground; resists wet better than other cereals; best chosen as first crop for inferior land, when newly broke

middling grassy soil is particularly suited for Oats; in rich ground more prolific for green fodder. It succeeds in rotation after every crop, though variously as regards yield, and best after clover. In volcanic soil of the Victoria-colony as much as 75 bushels of Oats have been obtained from an acre in one harvest, and in most favorable places in New Zealand exceptionally even double that quantity. In culture it extends not quite so far towards polar and alpine regions as barley, on account of the longer time required for its maturing; yet it will ripen still at latitude 69° 28′ in Norway [Schuebeler]. In tropical countries it can be grown for hay during the cool season. Varieties with seeds, separating spontaneously from the bracts (chaff) are: A. nuda, L. and A. Chinensis, Metzger, the Tatarian and Chinese Oats, which are the sorts preferred for porridge and cakes. Other varieties or closely allied species are: A. orientalis, Schreber, which is very rich in grain, and on account of the rigidity of its stem especially fitted for exposed mountain-localities; A. brevis, Roth, the short-grained Oats, which is particularly suitable for stable-fodder; A. strigosa, Schreber, which is a real native of Middle Europe, and deserves preference for sandy soil. Russian quas-beer is made of Oats [Langethal, Brockhaus]. The import of Oats into Victoria during 1887 was 393,378 centals, valued at £141,764. The average Oats-crop of the United States in latter years has been 549,000,000 bushels.

Averrhoa Carambola, Linné.

Probably to be regarded as a native of insular India, as there is a Sanskrit-name for this plant. A small tree. Not hurt by slight frost, except when very young. Sir Jos. Hooker noticed this small tree on the Upper Indus as far as Lahore. The fruit occurs in a sweet and acid variety; the former is available for the table raw, the other for preserves. That of A. Bilimbi (Linné) is of similar use, especially for tarts. Both ripen in East-Australia as far south as Moreton-Bay [Fred. Turner].

Avicennia officinalis, Linné.

From the coasts of South-Asia to those of South-Africa, all Australia and New Zealand. It is proposed by Dr. Herm. Behr, to plant this tree for consolidating muddy tidal shores. The copious nectar from the flowers eagerly sought by bees.

Azima tetracantha, Lamarck.

From South-India to South-Africa. A hedge-bush, growing freely in every kind of soil.

Baccharis pilularis, De Candolle.

California and Oregon. This evergreen bush can be grown for hedges, used also for garlands, wrappers or flower-bouquets and

other decorative purposes, as cut branches do not wither for a considerable time. It attains a height of 15 feet [Professor Bolander], and could readily be naturalized along sandy sea-shores.

Backhousia citriodora, F. v. Mueller.

Southern Queensland. Though only a small tree, it is well worth cultivating for the fragrance of its lemon-scented foliage, from which also a culinary and cosmetic oil can be cheaply distilled. Mr. T. Christy compares the oil to that from Lippia citriodora, and recommends Mons. Broquet's apparatus for this and similar distillations.

Bactris Gasipaes, Humboldt. (*Guilielma speciosa,* Martius.)

The "Peach-Palm" of the Amazon-River, ascending to the warm temperate regions of the Andes. Stems clustered, attaining a height of 40 feet. The fruit grows in large bunches; Dr. Spruce describes it as possessing a thick, firm and mealy pericarp, and when cooked to have a flavor between that of the potato and chestnut, but superior to either.

Bacularia Arfakiana, Beccari.

In Araucaria-forests of New Guinea up to 6,000 feet. A reed-like palm, evidently desirable for decorative purposes.

Bacularia monostachya, F. v. Mueller. (*Areca monostachya,* Martius.)

Eastern Australia, extending to extra-tropical latitudes. One of the best among small Palms for table-decoration. The stems sought for walking-sticks.

Baloghia lucida, Endlicher. (*Codiæum lucidum,* J. Mueller.)

East-Australia. A middle-sized tree. The sap from the wounded trunk forms, without any admixture, a beautiful red indelible pigment. The wood is adapted for turnery.

Balsamodendron Mukul, Hooker.

Scinde and Beluchistan. Yields the Bdellium-resin.

Balsamodendron Myrrha, Nees. (*Commiphora Myrrha,* Engler.)

Deserts of Arabia. This tree yields the commercial "Myrrh," but perhaps some other species may produce the same substance.

Balsamodendron Opobalsamum, Kunth. (*B. Gileadense,* Kunth. *Commiphora Opobalsamum,* Engler.)

Deserts of Arabia, Abyssinia and Nubia. A small tree. This species furnishes Mekka- or Gilead-Balsam. B. Capense (Sonder) is a closely allied congener from Extra-tropical South-Africa. Some other Balsam-shrubs deserve introduction into warm dry regions.

Bambusa Arnhemica, F. v. Mueller.

North-Western Australia. Many bamboos, not producing flowers except at long intervals under ordinary circumstances, could probably be forced by strong manuring into flowering and seeding.

Bambusa arundinacea, Roxburgh.*

The "Thorny Bamboo" of India. It likes rich, moist soil, and delights on river-banks; it is of less height than Bambusa vulgaris, also sends up from the root numerous stems, but with bending branches, thorny at the joints. Used in continental India for hedges. According to Kurz it will thrive in a climate too dry for B. Tulda and B. vulgaris. The seeds of this and some other Bamboos are useful as food for fowls. Whenever seeds of any Bamboos can be obtained fresh and disseminated soon, large masses of these plants could easily be raised in suitable forest-ground of other countries; Bamboo-seeds moreover, like Palm-seeds, ought to become a very remunerative article of commercial export for horticultural purposes under practical and experienced hands. All Bamboos intercept and decompose sewage.

Bambusa aspera, Poiret.

Indian Archipelagus. Attains a height of 120 feet. Stems very strong and thick. This species ascends to cool elevations of 4,000 feet.

Bambusa Balcooa, Roxburgh.*

From the Plains of Bengal to Assam. Proved hardy at the Cape of Good Hope. Height reaching 70 feet. With B. Tulda the principal Bamboo used by the natives for constructing large huts or sheds, but, as Roxburgh has pointed out, in order to render the material durable, it needs long previous immersion in water. Mr. Routledge recommends young shoots of Bamboos as paper-material. The seeds of Bambusa Tulda have been found by me to retain their vitality for some time and to germinate readily. Opportunities should never be missed of sending abroad fresh seeds of any Bamboos, whenever and wherever such may ripen.

Bambusa Blumeana, Schultes.

Insular India. This Bamboo, with its spiny buds and pendent branchlets, is according to Kurz one of the best for cattle-proof live-hedges among the Asiatic species. In continental India B. nana and B. arundinacea are much used for the same purpose. Periodic trimming is required.

Bambusa flexuosa, Munro.

China. Only 12 feet high, but very hardy, having resisted in Southern France a temperature of 8° F. [Geoffroy St. Hilaire].

Bambusa Senaensis, Franchet and Savatier.

Japan. A tall and hardy species, distinguished from all other Japanese Bambusaceæ by its large leaves. Young Bamboo-shoots (probably of several species) constitute part of the nourishment of all classes in Japan [Dupont].

Bambusa spinosa, Roxburgh.*

Bengal. A Bamboo, attaining 100 feet in height. The central cavity of the canes is of less diameter than in most other species; thus the strength for many technic purposes is increased.

Bambusa vulgaris, Wendland.*

The large unarmed Bamboo of Insular India. Height to 70 feet; the stems may attain a length even of 40 feet in one season, though the growth is slower in cooler climes. It has proved to be capable of resisting occasional night-frosts. It is the best for building bamboo-houses. Immersion in water for some time renders the cane still firmer. To the series of large thornless bamboos belong also Bambusa Tulda and Bambusa Balcooa of India, and Bambusa Thouarsii from Madagascar and Bourbon. These Bamboos are much used for various kinds of furniture, mats, implements and other articles. Besides these, Kurz enumerates as among the best Asiatic Bamboos for building purposes: Gigantochloa aspera, G. maxima, G. attar; while Teysmann notes G. apus for the same purpose. Kurz recommends further, Bambusa arundinacea, B. Balcooa, B. Brandisii, B. polymorpha, Dendrocalamus Hamiltoni and Schizostachyum Blumei. In the Moluccas, according to Costa, Gigantochloa maxima or an allied species produces stems thick enough to serve when slit into halves for canoes. Bamboos are utilized for masts and spars of small vessels. Bambusa Balcooa was found by Walwich to grow 12 feet in 23 days. Bambusa Tulda, according to Roxburgh, has grown at first at the rate of from 20 to 70 feet in a month. Fortune noticed the growth of several Chinese Bamboos to be two to two and a half feet a day. There are many other kinds of Bamboo eligible among the species from China, Japan, India, tropical America and perhaps tropical Africa. Two occur in Arnhem's Land, and two at least in North-Queensland. New Guinea is sure to furnish also additional kinds of technical importance or eminent horticultural value. Indeed one species forms a belt just below the sub-alpine zone [Sir W. McGregor]. If the summit of a young Bamboo within the last sheath is slit, a simply forked growth may be obtained for ornamental purposes.

Baptisia tinctoria, R. Brown.

The "Wild Indigo" of Canada and the Eastern United States. A perennial herb. It furnishes a fair pigment, when treated like the best Indigoferas; also used as an antiseptic in medicine.

Barbarea vulgaris, R. Brown.

In the cooler regions of all parts of the globe, ascending to alpine zones. Hardy to lat. 64° 5′ in Norway [Schuebeler]. This herb furnishes a wholesome salad. As with other raw vegetables, particularly watercress (Nasturtium aquaticum, Trag.), circumspect care is necessary, to free such salads from possibly adherent Echinococcus-ova or other germs of entozoa, particularly in localities where hydatids prevail. But the Nasturtium-Watercress should culturally altogether be avoided, as it may by quickly spreading choke irrigation-channels, rivulets and low canals to such an extent, as to involve large annual expenditure for clearing. Barbarea is an excellent honey-plant [Muenter], particularly for cold regions. Several allied species exist.

Barosma serratifolia, Willdenow.

South-Africa. This shrub supplies the medicinal Bucco-leaves. B. crenulata, Hooker (Diosma crenulata, L.) is only a variety of this species. Active principles: a peculiar volatile oil, a peculiar resin and a crystalline substance called diosmin. Empleurum serrulatum (Solander), a small South-African shrub, yields also Bucco-leaves as noted by Prof. Eichler.

Basella lucida, Linné.

India. Perennial. This spinage-plant has somewhat the odor of Ocimum Basilicum; other species serve also for culinary purposes.

Basella rubra. Linné.

From Southern Asia to Japan. This annual or biennial herb serves as a spinage of pleasant coloration, and is of quick growth, but is not possessed of the agreeable flavor of real spinage. It yields also a rich purple dye, not easily fixed however [Johnson].

Bassowia solanacea, Bentham. (*Witheringia solanacea,* L'Heritier.)

South-America. This perennial herb needs more trial-culture, on account of its large edible tubers.

Batis maritima, Linné.

Central America and northward to Florida, also the Sandwich-Islands. This shrub can be used advantageously to fix tidal sediments for the reclamation of harbor-lands and of otherwise valuable shore-ground.

Beesha elegantissima, Hasskarl.

Java, on mountains of about 4,000 feet elevation. Very tall and exceedingly slender; the upper branches pendulous. A hardy species of Bamboo.

Belis jaculifolia, Salisbury. (*Cunninghamia Sinensis,* R. Brown.)

Southern China. A tree, attaining 40 feet in height. Though too slow for timber-growth, it should not be passed in this work, as its Araucaria-like habits entitles it to a place in any arboretum, which is not subject to severe frost; it proved hardy at Arran [Rev. D. Landsborough]. The tree furnishes resin; the timber serves building purposes well.

Benincasa cerifera, Savi.

India, Philippines, China, Japan, perhaps also North-Eastern Australia and Polynesia. This annual plant produces a large edible gourd, which in an unripe state forms part of the composition of many kinds of curry. Can also be used like pumpkins. Mrs. Soutter recommends this fruit especially for jam. Seeds will keep for several years.

Berberis Asiatica, Roxburgh

Himalaya. A Berberry-shrub. Hardy in Christiania [Schuebeler]. One of the best among numerous species with edible berries. Among these may particularly be mentioned B. Lycium (Royle) and B. aristata (De Candolle), which also yield valuable yellow dye-wood [Dr. Rosenthal]. All kinds of Berberry-shrubs must be kept away from cereal fields, as they might become the seat of the Aecidium-state of one of the principal rust-fungs, Puccinia graminis. An elaborate article on Berberine has been furnished by Dr. W. H. Perkin in the Journal of the Chemical Society, December, 1890.

Berber's buxifolia, Lamarck.

From Magelhaen's Straits to Chili. This bush, according to Dr. Philippi, is the best among the South-American species for berries, which are comparatively large, black, hardly acid, but slightly astringent. In Valdivia and Chiloe they are frequently consumed.

Berberis Darwinii, Hooker.

Chiloe and South-Chili. Considered one of the most handsome of shrubs for garden-hedges. Hardy in England, also up to Christiania. Several other evergreen Berberry-shrubs serve the same purpose.

Berberis Japonica, R. Brown.

Japan. Bears some frost. The acidulous berries are used for jellies, also for coloring confectionery [Dr. K. Mueller].

Berberis Nepalensis, Sprengel.

Himalayas, at elevations between 4,000 and 8,000 feet. Hardy to lat. 59° 55′ in Norway [Schuebeler]. The fruit of this evergreen species is edible. The European B. vulgaris L. is excluded here as harboring the Aecidium-state of the Puccinia-"Rust."

Bertholletia excelsa, Humboldt and Bonpland.

Countries on the Amazon- and Orinoco-Rivers. A large tree. Fruit about a foot in diameter; the seeds known as Brazil nuts. It succeeds still just outside the tropics in East-Australia, as does also Adansonia Gregorii, but the growth is there slow [J. Edgar].

Beschorneria yuccoides, Hooker.

Mexico, at rocky elevations from 8,000 to 10,000 feet [Finck]. This handsome plant will bear slight frost. The stem attains a height of 6 feet, and produces flowers annually like Yuccas. The leaves yield a remarkably fine and strong fibre [T. Christy]. The two other known species, also from Mexico, B. tubiflora (Kunth) and B. Parmentierii (Jacobi), are probably similarly useful.

Beta vulgaris, Linné.

The "Beet and Mangold-Wurzel." Middle and Southern Europe, Western and Middle Asia, Northern Africa, extending naturally to the Canary-Islands. Hardy in Norway to lat. 70° 4′ [Schuebeler]. This well-known perennial or biennial herb ought to engage the general and extensive attention of any farming population. Can be grown for mere foliage even in sandy soil near the Sea, and is often chosen for the first crop on heath-lands in Northern Germany. Produces still good crops in sub-tropical countries. The herbage is most valuable as a palatable and nutritious spinage; the root is of importance not only as a culinary vegetable, but, as is well known, also for containing crystallisable sugar. The sugar of the beet is indeed now almost exclusively consumed in Russia, Germany, Austria, France, Sweden and Belgium; and these countries not only produce beet-sugar for home-consumption, but also export it largely to the neighboring States. The white Sicilian Beet is mainly used for salads, spinage and soups. The thick-ribbed variety serves like asparagus or sea-kale, dressed like rhubarb. The seeds will retain the power of germination for several years; they mature well even in the hot desert-tracts of Central Australia, where beet for the table can be obtained throughout the year [Rev. H. Kempe]. Mangold-crops succeed on some sorts of freshly reclaimed soil. Cereal-soil, particularly such as is fit for barley, is generally adapted also for the culture of beet. The rearing of the root and the manufacture of the sugar can be studied from manifold works; one has been compiled by Mr. N. Levy, of Melbourne. A deeply stirred drained soil, rich in lime, brings the saccharine variety of beet to greatest perfection. The Imperial beet yields from 12 to 20 per cent. sugar. The Castlenauderry, the Magdeburg, the Siberian White-rib and the Vilmorin-Beet are other varieties rich in sugar. About 5 lbs. of seed are required for an acre. In rotation of crops the beet takes its place best between barley and oats. In Middle Europe the yield averages 14 tons of sugar-beet to the acre, and as many hundredweight of raw sugar. The mercantile value of the root, at distilleries, ranges from 10s. to 20s. per

ton. In climates, not subject to frost, the beet-harvest can be extended over a far greater portion of the year than in Middle-Europe. The extraction of the sap is effected generally by hydraulic pressure; the juice is purified with lime and animal charcoal; excess of lime is removed by carbonic acid, and the purified and decolorised juice is evaporated in vacuum-pans, with a view to prevent the extensive conversion of the crystallisable sugar into treacle. The production of beet-sugar needs less labor than that of cane-sugar; also the harvest is obtained in so short a time as eight months. The beet has shown itself subject neither to fungus-diseases nor to extensive attacks of insects. It is mostly grown in extra-tropical zones, while the sugar-cane is confined to tropical and sub-tropical latitudes. Beet-culture, by directly or indirectly restoring the refuse, ameliorates the soil to such an extent, that in some parts of Europe land so utilized has risen to four-fold its former value. The beet furthermore affords one of the most fattening stable-fodders; and thus again an ample supply of manure. In the beet-districts of Middle Europe about one-sixth of the arable land is devoted to beets, yet the produce of cereals has not been reduced, while the rearing of fattened cattle has increased. Notwithstanding a heavy tax on the beetsugar-factories in Europe, the industry has proved prosperous, and assumes greater and greater dimensions. In 1865 the sugar consumption of Europe amounted to 1,583,825 tons, one-third of which had been locally supplied by the beet, from over one thousand factories. Treacle obtained from beet is distilled for alcohol. For establishing remunerative factories on a large and paying scale, it has been suggested, that farmers' companies might be formed. For ascertaining the percentage of sugar in the beet, saccharometers are used. In Germany some scientific periodicals are exclusively devoted to the fostering of this industry. In 1875 the total production of beet-sugar amounted to 1,318,000 tons [Boucheraux]. In 1882 fully 38 per cent. of the world's supply of sugar was derived from the beet. The beet-sugar crop of 1886 in all Europe was estimated at 2,500,000 tons. During 1886 the import of unrefined beet-sugar into Britain was 333,590 tons, valued at £3,988,534, irrespective of the import of refined. The present production of beet-sugar amounts to about 3 million tons (1,650,000 tons in Germany and Austria) more than the total of the cane-sugar now produced.

Betula acuminata, Wallich.

Himalaya, between 3,000 and 10,000 feet. Attains a height of 60 feet, and thrives along forest-streams. The wood is hard, strong and durable. Another Himalayan Birch, B. utilis (D. Don), grows on arid ground, and produces good timber of less hardness.

Betula alba, Linné.

"White Birch." The common Birch of Europe and Extra-tropical Asia and North-America. With some Willows approach-

ing nearer to the North-Pole than any other woody vegetation, but ceding in milder regions before the Beach, when occurring mixed. It attains a height of 80 feet, and a stem-girth of 16 feet, and would, when cultivated, thrive best in moist glens of ranges or in the higher regions of mountains, and it would form at the alpine zone also excellent shelter-plantations. The variety B. pubescens (Ehrhart) attains still a height of 60 feet in lat. 70° N. in Norway [Schuebeler]. Content with the poorest soil. The variety B. populifolia (Willd.) extends to North-Eastern America, the variety B. occidentalis (Hooker) to North-Western America. The durable bark serves for rough roofing and watertight baskets. Wood white, turning red, tough, adapted for spools, skates, wooden shoes, shoe-pegs and many other minor purposes, also for some parts of the work of organ-builders; affords like that of other Beeches charcoal for gunpowder. The oil of the bark is used in preparing the Russian leather. The leaves, when boiled with the addition of alum and potash, produce a yellow dye, which is called in Germany Schüttgelb.

Betula lenta, Willdenow.

The "Cherry-Birch" of North-America. A tree reaching to 80 feet in height, and 2 feet in stem-diameter, liking moist ground, but also content with dry soil. Comparatively quick in growth. Northward, hardy to Christiania in Norway [Schuebeler]. Wood rose-colored or dark, fine-grained, excellent for furniture. It is so heavy, that when fresh it will not float in water. It is used for ships' keels, machinery, furniture and other purposes, where strength, hardness and durability are required. Bark of a somewhat aromatic odor. Several Birches occur in Japan; these might well be tried elsewhere.

Betula lutea, Michaux.

The "Yellow or Gray Birch" of North-Eastern America. Height sometimes 80 feet. Adapted for moist forest-land. In timber similar to B. lenta. The wood is used for shoe-lasts and various other purposes.

Betula nigra, Linné.

The "Red Birch" or "River-Birch" of North-America. One of the tallest of Birches, attaining to 90 feet. Occasionally more than 3 feet in stem-diameter. If grown on the banks of streams, it will bear intense heat. The wood is compact, of a light color, easily worked, excellent for turning, also in use by cabinet-makers and carriage-builders; well adapted to sustain shocks and friction [Robb]. It is also used for shoe-lasts, bowls and trays, and the saplings and branches for hoops. The bark is well adapted for rough roofing. Twigs of the Red Birch furnish one of the best materials for rough brooms. Hardy at Christiania [Schuebeler].

Betula papyracea, Aiton.

The "Paper-Birch" of North-America. Generally a larger tree than B. alba, with a fine-grained wood and a tough bark; the latter much used for portable canoes. Likes a cold situation. Hardy to lat. 63° 55′ in Norway [Schuebeler]. Wood rather heavy, hard and tough, but adapted only for indoor-work, extensively employed for spools, shoe-lasts, pegs and various turnery.

Bixa Orellana, Linné.

Tropical America. The Arnatto-plant. This shrub or small tree can be grown to advantage for its pigment as far south as Moreton-Bay and probably even further southward. Succeeds in Jamaica up to 3,000 feet [W. Fawcett]. Culture most easy. Fruits well in Natal [J. M. Wood].

Boehmeria nivea, Gaudichaud.*

The "Ramee or Rhea." Southern Asia, as far east as Japan This bush furnishes the strong and beautiful fibre, woven into a fabric, which inappropiately is called grass-cloth. The plant can be raised from seeds, which should be sown on manured or otherwise rich and friable soil, when a crop is obtained in the third year, or it can be multiplied quickly from cuttings. Rich forest-soil seems best adapted for the Ramee, where occasional irrigation can be applied. According to Mr. W. H. Murray, failures of crops are unknown in California; replanting is not required. Professor Hilgard says, that it is one of the few plants, which will prosper on alkaline land. In the open lands at Port Phillip it suffers from the night-frosts, although not to such an extent as materially to injure the plant, which sends up fresh shoots, fit for fibre, during the warm season. The plant has been cultivated and distributed by the writer since 1854 in the Botanic Garden of Melbourne, being also here readily propagated from cuttings, the seeds rarely ripening with us. Numerous shoots spring after cutting from the same root. Ordinarily three crops can be obtained a year; but under irrigation, according to Professor Hilgard, the plant is cut four times annually in California. Colonel Hannay and Dr. Forbes Watson record, that in Assam even four to six crops are cut annually, that obtainable in the cool season providing the strongest fibre; the latter attains sometimes the length of 6 feet. The produce of an acre has been estimated at two tons of fibre, which is always best obtained from the young shoots. The bark is softened by water or steam, and then the bast is separable into its tender fibres; but as in the case of many other fibre-plants, both the so-called wet and the dry process can be applied, the latter mode preferable, particularly in a dry clime. Dr. Collyer, of Saharumpore, boils the whole branches with soap-water [a process used here since 1866 for separating the Phormium-fibre in rope-making, L. Morton] for the easy separation of the fibre, of which he obtained 150 lbs. from a ton of Ramee branches. He also perfected machinery to render the process easy

and more remunerative. Fibre further prepared by Bonsor's process can be spun into the finest yarn. Mr. D. E. Martin, of the Agricultural Department of Victoria, draws attention to the dry method, adopted by M. Favier in Gerona, further to the several machines lately constructed by M. Billiou, of Marseilles, by M. Kaulek, of Paris, by M. Scheifner, of the same place, and by Don. D. Priesto, in Barcelona. M. Vial's process also deserves attention. Superior machines have also recently been invented in the United States; one by Mr. W. H. Murray seems particularly recommendable [See Hilgard's Bulletin, January, 1891]. By Mr. Ch. Toppan's process the fibre is now easily freed from any sticky, corticating substances, and can be spun and carded by ordinary cotton, and wool-machinery. The fibre is strong and durable, glossy, to some extent with the appearance of silk. It was known in Europe to be used in Japan for ropes and cordage since Kaempfer's time, and is said to be three times as strong as hemp for this purpose; it is not easily subject to decay in water. But this fine and light fibre is also well adapted for a variety of textile fabrics, enduring wear to an extraordinary extent, and not particularly subject to attacks by insects. Yarn is already made of it by the ton in Baltimore [T. Albee Smith.] The ordinary market-value of the fibre is about £40 per ton; but Dr. Royle mentions, that it has realised at times £120. Lately the culture of the Ramee has assumed sufficient magnitude to bring the fibre into competition with, or even superiority to other leading textile material. Also the leaves are useful, as they serve as food for silkworms [W. T. Dyer]. Other species of Boehmeria require to be tested, among them one, which was discovered in Lord Howe's Island, namely, B. calophleba (Moore and Mueller).

Boletus bovinus, Linné.

Europe. Besides this species Dr. Goeppert mentions also the following, as sold for food in the market of Silesia: B. circinans, Persoon; B. edulis, Bulliard; B. luteus, Linné; B. sapidus, Harzer; B. scaber, Bulliard; B. subtomentosus, Linné; B. variegatus, Swartz. Dr. Cooke lauds B. æstivalis, Fries, for food. Dr. L. Planchon's list of edible fungs of France includes from this generic group: B. æreus, Bulliard; B. granulatus, Linné; B. castaneus, Bulliard. Among the Victorian species one, allied to B. edulis, attains a weight of 3 lbs., and the pileus then is of 12 inches width. The genus is dispersed over the globe in numerous species, many doubtless fair esculents.

Bongardia Rauwolfi, C. A. Meyer.

From Greece through Turkey to the Caucasus. A perennial herb, the leaves of which are utilised like culinary sorrel.

Borassus Æthiopicus, Martius.

Africa, from Zanzibar to Egypt. A palm of gigantic dimensions, its stem attaining 9 feet in diameter at the base, or 7 feet at 4

feet above the ground; sometimes even stems have been measured having a circumference of 37 feet. Leaves occur as much as 12 feet across; they serve for the manufacture of baskets, mats, ropes and sieves. The edible portion of the fruit is yellow, stringy, of a fruity flavor. The sap, obtained from incisions in the stem under the leaves, yields a kind of palm-wine. In its natural home the tree always denotes water [Colonel Grant]. Sir W. Hooker admits only one species, and regards Africa solely as its home. Hardier than Cocos nucifera.

Borassus flabelliformis, Linné.

The "Palmyra." From the Persian Gulf to India, extending to 30° north. This noble palm attains a height of 100 feet. The pulp of the fruit serves as food. Enormous masses of sugar and toddy are produced in India from the sap, which flows from incisions of the stalk of the unexpanded flowers. This palm, wherever hardy, should be reared for scenic plantations. It does well to the tropic of capricorn in East-Australia [Edgar]. Assumed to reach, like the Date-Palm, an age of more than 200 years. Many other palms are notable for longevity; thus Euterpe oleracea has been calculated to attain 130 years; Cocos oleracea, 650 years; Cocos nucifera, 330 years, according to the number of their stem-rings [Langethal], of which however perhaps more than one are formed in a year.

Boronia megastigma, Nees.

In Western Australia, on margins of swamps. This remarkable bush is recorded here as an emblem of mourning, its externally blackish flowers rendering it especially eligible for graves. Industrially it interests us on account of its very fragrant blossoms, for the sake of which this bush well deserves to be cultivated. The perfume could doubtless be extracted and isolated, particularly by absorbents in vacuum. Individual plants of this Boronia will endure in a cultivated state for very many years. B. heterophylla (F. v. M.) from King George's Sound is of similar but not quite so strong a scent.

Borrago officinalis, Linné.

Southern Europe, Orient. An annual herb, rich in nitrate of potassium, occasionally used for medicinal purposes or as an admixture to salad. Readily disseminating itself; not to be overlooked as a honey-plant.

Boswellia papyrifera, Hochstetter.

Morocco, Nubia and Abyssinia, forming entire forests about Bertat on the Atlas. This tree exudes a kind of Olibanum-resin, and represents apparently one of the hardiest species of this or allied genera.

Boswellia serrata, Roxburgh. (*B. thurifera*, Colebrooke.)

India. A deciduous tree, living in arid forest-regions. Yields an aromatic resin. The real Olibanum is exuded by B. Carteri (Birdwood) of Arabia and tropical Africa.

Boussingaultia baselloides, Humboldt.

South-America. This hardy climber is well fitted for bowers; the mucilaginous tubers are edible. It is not uncommonly grown as a climber on verandahs, where no severe frosts occur. According to Prof. Hieronymus the leaves serve in the native country of the plant for spinage.

Bouteloua polystachya, Bentham.

New Mexico, Texas and Arizona. One of the Gramma-grasses of the prairies, called with some other species also Muskit-grass; gregarious; famed for nutritive value; fit for arid regions. Dr. Vasey recently enumerated fourteen kinds of Bouteloua, of which B. fœnea, B. eriopoda and B. oligostachya (Torrey) are mentioned as those best liked by the herds; others proved excellent in Argentina.

Bouvardia longiflora, Humboldt.

Mexico, in temperate regions. This showy perennial shrub is not without significance as a scent-plant. Cut flowers retain their odour unusually long. One of the best of autumn-flowers. Thrives well at Port Phillip.

Brabejum stellatifolium, Linné.

South-Africa. The nuts of this usually small tree are edible, resembling those of our Macadamia ternifolia, to which also Brabejum is closely allied in foliage and flowers. The nuts are also similar to those of the Chilian Guevina Avellana. The fruit should be roasted, otherwise it is deleterious. Flowers sweet-scented.

Brachychiton acerifolius, F. v. Mueller.

The East-Australian Flame-tree. An evergreen shade-tree, attaining a height of 60 feet, with magnificent trusses of crimson blossoms. Like some congeners eligible for shading promenades, when rapidity of growth is no object. The mucilaginous sap, when exuded, indurates to a kind of Bassorin-Tragacanth, which Mr. J. H. Maiden identifies with Pararabin and traces to other congeners as well as to some Sterculias.

Brachychiton populneus, R. Brown.

From Gippsland to Southern Queensland. A splendid avenue-tree. Mr. Rudder records stems over 11 feet in circumference at 4 feet from the ground. Bast very tough; hence one of the curriyongs of the Aborigines. Leaves eaten by pasture-animals.

Brahea dulcis, Martius.

Mexico, as far as its northern parts, and ascending to 4,500 feet. A Brahea-Palm has also been discovered as far north as Arizona, 32° [Drude].

Brahea edulis, Herm. Wendland. (*Erythea edulis,* S. Watson).

Lower California. Height to 30 feet. The clusters of plum-shaped fruits sometimes weigh 40 lbs., and are eaten by domestic animals. B. armata is a closely allied species from the same region.

Brassica alba, Visiani. (*Sinapis alba,* Linné.)

White Mustard. Eastern Europe, Northern Africa, Northern and Middle Asia. An annual. The seeds are less pungent than those of the Black Mustard, but used in a similar manner. The young leaves of both are useful as a culinary and also antiscorbutic salad. Can be employed with great advantage as green manure and suppresses weed simultaneously [W. Emerson McIvor]. The cold-pressed oil of mustard-seed serves for table-use. Dr. M. T. Masters enumerates Brassica dichotoma, B. Pekinensis, B. ramosa and B. glauca among the mustards, which undergo cultivation in various parts of Asia, either for the fixed oil of their seeds or for their herbage. From 15 lbs. to 20 lbs. of seed of the White Mustard are required for an acre. In the climate of California 1,400 lbs. of seed have been gathered from an acre. Can be grown in shallow soil, even on land recently reclaimed from swamps. It prefers argillaceous ground. The return is obtained in a few months. The stalks and foliage after the seed-harvest serve as sheep-fodder. In Norway the plant comes still to perfection as far north as lat. 70° [Schuebeler]. Matures seeds well even in the desert-tracts of Central Australia [Rev. H. Kempe].

Brassica Chinensis, Linné.

China and Japan. Serves like B. oleracea for cabbage, and produced in cultivation new varieties, particularly for use very late in the season. The seeds in Japan extensively pressed for oil. B. Cretica (Lamarck) is a woody Mediterranean species.

Brassica juncea, J. Hooker and Thomson. (*B. Widdenowii,* Boissier; *Sinapis juncea,* Linné.)

From Middle Africa to China. According to Colonel Drury cultivated all over India for Sarepta-Mustard seed; also extensively raised in China for pickle [Consul Bourne]; also a good salad-plant.

Brassica nigra, Koch. (*Sinapis nigra,* Linné.)

The "Black Mustard." Europe, Northern Africa, Middle Asia. An annual. Succeeds also yet in sub-tropic latitudes. The seeds crushed and passed through a sieve constitute mustard of com-

merce. For medicinal purposes the seeds of this species are preferable for sinapisin and especially sinapisms. Through aqueous distillation a volatile oil of extreme pungency is obtained from mustard-seeds. In rich soil this plant is very prolific; and in forest-valleys it is likely to remain free from the attacks of aphides. Chemical constituents: a peculiar fixed oil, crystalline sinapin, the fatty sinapisin, myronic acid and myrosin. All mustards can be regarded as honey-plants. Brassica-seeds of various kinds retain their vitality for several years.

Brassica oleracea, Linné.*

An annual or biennial coast-plant, indigenous to various parts of Europe. Mentioned here also with a view of showing, that it might be naturalised on any rocky and sandy sea-shores. One of the best plants for newly reclaimed lands. From the wild plant of the coast have originated various kinds of cabbages, broccoli, cauliflower, Brussels-sprouts, kale, kohl-rabi and others, the last mentioned being a variety with a very turgid stem. Plants of Broccoli have been known to attain 9 feet in circumference [Dr. Masters]. Some regard the fattening qualities of cabbage as superior to those of turnips, particularly for stable-food during the autumnal season. The gluten of cabbages on one acre has been estimated at 1,500 lbs. against 1,000 lbs. of gluten obtainable from turnips. Other races of this species are collectively represented by Brassica Rapa, L. (B. campestris, L.), the wild Navew, yielding most of the varieties of turnips, some handed down to us from ancient times with other cultivated forms. Again, other varieties are comprehended within Brassica Napus, L., such as the Swedish and Teltower turnips, while the Raps-seed, so important for its oil (Colza), is also derived from a form of B. Napus. The Raps-plant should be reared extensively for agrarian produce, giving a rapid return, wherever it remains free from aphides. Ordinary Raps is a good admixture to summer-fodder. Valuable in rotation of crops. Raps sown on sandy land in Victoria sustained 20 sheep on an acre during autumn and early winter, and yet the land was available for other crops in the next summer. Important where bees are kept. The hardier turnips can be produced on the highest Alps, as they are grown even within the Arctic Circle, and according to Sir J. Hooker at a height of 15,000 feet in the Himalayan mountains; they succeed also still well in the Faroe-Islands, and yet some varieties of turnips are also a reliable winter-crop in Central Australia. Oil-Raps and Turnips are grown as far north as 70° 22′ in Norway [Schuebeler]. Rhind mentions a very tall variety, introduced from the Vendée, as cattle-provender. Within the tropics grown during the cool season. The annual import of Raps-seeds in Britain during many years was valued at a million pounds; in 1884 it was one-and-a-half millions. In the cold zone the winter-varieties of cabbage are particularly important. Turnips succeed generally even under the equator. Only the turnip-varieties ripen seeds for resowing in the

deserts of Central Australia [Rev. H. Kempe], though cabbage, cauliflower and kohl-rabi can there be grown through the whole year; cabbages even in the lowlands of the South-Sea Islands. In Britain, the kitchen-vegetables from this species are obtained earliest from the Channel-Islands, latest from the Scotch highlands.

Briza media, Linné.

Europe, Western and Northern Asia. A perennial early but slender grass, particularly fitted for poor soil in cool climates. Sinclair regards its nutritive power considerable, and notes that it is readily consumed by horses, cattle and sheep. Messrs. Sowerby and C. Johnstone recommend it on account of the scantiness of its foliage merely for naturalisation. Prof. Hieronymus mentions as extra-tropic South-American sheep-grasses, B. Lamarckiana, Nees., B. stricta, Hooker, and B. triloba, Nees., all perennial.

Bromus asper, Murray.

Europe, Northern and Middle Asia. A good perennial fodder-grass for wood-regions, but like Festuca gigantea late in the season.

Bromus ciliatus, Linné.

North-America. A perennial fattening grass, resembling the Prairie-grass, growing in mild temperate climes all the winter and also during summer, if drought is not too long continued, starting afresh after the least rain [Dr. Curl].

Bromus erectus, Hudson.

Europe, Northern Africa, Western Asia. Important as a perennial nutritious grass for dry lime-stone regions; much liked by cattle and sheep. Particularly valuable for poor calcareous soil [Dr. Stebler]. Prof. Naudin regards it as superior to Lolium for lawns in hot dry regions. B. mollis, L. is dangerous for spreading the red rust fungus, Puccinia straminis (Uredo Rubigo), and so it would likely be with other congeners.

Bromus inermis, Leyseer.

Europe and Northern Asia. Perennial, rather tall, root-creeping. Lauded by Prof. Hilgard for Californian growth, as "Hungarian Brome-grass."

Bromus unioloides, Humboldt.* (*B. Schraderi,* Kunth.)

From Central America to the sub-alpine zone of Northern Argentina. In Australia called the Prairie-grass. It has spread over many parts of the globe as naturalised. The writer saw it disseminated on the mountains of St. Vincent's Gulf as early as 1847. It is one of the richest of all grasses, grows continuously and spreads rapidly from seeds, particularly on fertile and somewhat humid soil, and has proved as a lasting and nutritious fodder-grass or pasture-

grass, one of our best acquisitions. Very early out in the season for fodder. Kept alive in the hottest and driest parts of Central-Australia, where it was first introduced by the writer of this work. When other grasses are failing in many places in winter, this Bromus sustains in New England well the pasture-animals [R. MacFarland]. In Norway it comes to perfection up to lat 67° 55' [Schuebeler]. Chemical analysis in early spring gave: albumen, 2·80; gluten, 3·80; starch, 3·30; gum, 1·70; sugar, 2·30 per cent. [F. v. Mueller and L Rummel].

Broussonetia papyrifera, Ventenat.

The "Paper-Mulberry-tree." Islands of the Pacific Ocean, China, Japan, perhaps only truly indigenous in the last-named country. Attains a maximum height of 40 feet; hardy in the milder regions of Middle Europe. The bark can be converted into very strong paper. It can also be used for textile fabrics; furthermore, the cloth made from it can be dressed with linseed-oil for waterproof coverings. In cultivation the plant is kept like an osier. The leaves cannot be used for silkworms. European fabrics have largely superseded the clothing made of this plant in the South-Sea-Islands.

Buchloe dactyloides, Engelmann.

The true Buffalo-grass of Kansas, also known as one of the mesquite-grasses, naturally extending from Canada to Texas, forming a large proportion of the food of the buffaloes on the prairies. [Engelmann]. Dicœcious, creeping, only rising to half a foot or less, but overpowering the Boutelouas. It is extremely fattening, but apt to be suppressed by coarser grasses on ground, where these are not trampled out or kept down by pasture-animals. One of the best of summer-grasses, resisting also some frost.

Buddlea Asiatica, Loureiro.

Continental and insular India up to 7,000 feet, thence to China, the Philippines and New Guinea. Shrub, attaining to 15 feet; eligible for ornamental copses; flowers produced in profusion, sweet-scented. B. variabilis (Hemsley) is among the Chinese species one of the most ornamental.

Buddlea Colvillei, J. Hooker and Thomson.

Himalayan mountains, at elevations of 9,000 to 12,000 feet. One of the hardiest of all species, attaining a height of 20 feet, but not so quick of growth as some other kinds. Extremely handsome, with its masses of dark crimson flowers [Gamble].

Buddlea globosa, Lamarck.

Andes of Chili and Peru. Withstands the winter-cold of Arran. The author has in this as in very few other instances broken through the rule, adopted for this work, not to accept into it any

plant of ornamental value alone; but on the present species almost all the praise of B. Madagascariensis can also be bestowed, and it is really useful likewise for screening unsightly fences quickly and also for other kinds of hedgings. A similar species from the some geographic region is B. connata (Ruiz and Pavon).

Buddlea macrostachya, Bentham.

Mountains of India, from 3,000 to 7,000 feet. Shrub with fragrant spikes of flowers with yellowish tube, bluish lobes and orange-colored orifice. Highly desirable for æsthetic culture with several congeners.

Buddlea Madagascariensis, Lamarck.

Madagascar, Bourbon and Rodiguez. Of the numerous species of Buddlea the most eligible one for shelter-copses, on account of of its great size and always tidy appearance, as well as vigor and celerity of growth. It is ever-flowering, highly elegant, tolerant to many kinds of soil, bears some frost, and like most congeners is easily propagated from cuttings in the open air. Much frequented by bees.

Buddlea paniculata, Wallich. (*B. crispa,* Bentham.)

Himalayan mountains, at altitudes between 4,000 and 7,300 feet, extending to Ava, Cabool and Beloochistan. Attaining the size of a small tree, resisting English winters unharmed, merely protected by a wall; flowering there already from the beginning of February till May, scenting the atmosphere around with fragrance [Sir Will. Hooker]. The trusses of flowers resemble those of the Lilac in shape and color.

Bursera elemifera, J. Hooker.

Mexico, up to the temperate plateau. This tree furnishes the Mexican Copal or Elemi.

Butea frondosa, J. Koenig and Roxburgh.

The "Dhak or Pulas" of India. This magnificent tree extends to the Himalayan mountains, ascending to elevations of 4,000 feet, and bears some few degrees of frost. Hardy in Australia as far south as Moreton-Bay [Fred. Turner.] It is very rich in a peculiar kind of kino, which according to Muspratt contains up to 73 per cent. of Tannin. From the flowers a beautiful red dye is prepared [P. L. Simmonds]. The lac-insect is also nourished by this tree; and the shellac from it is inferior only to that of Schleichera trijuga; the third quality comes from Ficus religiosa [Dr. G. Watt.] Calcutta exports generally shellac to the value of about a million pounds annually.

Butomus umbellatus, Linné

The "Flowering Rush." Europe, Northern and Middle Asia. This elegant perennial water-plant is mentioned here more for its value in embellishing our lakes and water-courses than for the sake of its roots. The latter, when roasted, are edible. The plant would live in sub-alpine rivulets. In Norway it is hardy to lat. 59° 55′ [Schuebeler].

Buxus Macowani, Oliver.

South-African Box-tree. In the valleys of the Keiskama and Buffalo-River. The stems attain a maximum height of 25 feet and a diameter of about one foot. Yields a good box-wood for engravers' purposes [B. D. Jackson], so the Socotra-species, B. Hildebrandti [J. B. Balfour].

Buxus microphylla, Siebold and Zuccarini.

Japan. There used for the best of wood-engravings and turnery; considered as good as ordinary box-wood. Native name, Tsougné [E. Dupont].

Buxus sempervirens, Linné.*

The Turkish Box-tree. England, Southern Europe, Northern Africa, South-Western Asia, extending to Upper India and Japan. This slow-growing tree should be planted to provide the indispensable box-wood for wood-engravers and instrument makers, no perfect substitute for it having been discovered as yet. It is also employed for shuttles, rollers and various other select implements, clarionets, flutes, flageolets. Box-wood, on account of its extreme density, can best be used as an unit in comparative scales of the closeness of various kinds of wood. The box-tree needs calcareous soil for its best development. In Norway it is hardy to lat. 63° 26′, according to Prof. Schuebeler, who saw a plant 11 feet high and 6 inches in stem-diameter at lat. 58° 58′. Among allied species B. Balearica attains a height of 80 feet. Other congeners are B. subcolumnaris, B. Cubana, B. Purdieana, B. citrifolia, B. acuminata, B. lævigata, B. Vahlii, B. gonoclada, B. retusa, B. glomerata, B. Wrightii, all from the West-Indies, B. Madagascarica, also B. longifolia from Turkey, and B. Wallichiana from the Himalayas. It does not however appear to be known how the wood of any of these, nor of the various species of the Indian genus Sarcococca or the genus Styloceras of the Andes compares with true box-wood; nor is it known, whether or not they are of much more rapid growth.

Cæsalpinia Bonduc, Roxburgh. (*Guilandina Bonduc,* Linné.)

Widely dispersed through the inter-tropical regions of both hemispheres with G. Bonducella, L. These two species would be well adapted for hedges in the warmer parts of the temperate zone.

The seeds of C. Bonducella are admitted into the Indian pharmacopœa as a febrifuge; Thwaites says that every part of the plant is used medicinally in Ceylon [Dr. G. Watt].

Cæsalpinia brevifolia, Bentham. (*Balsamocarpon brevifolium,* Clos.)

Chili, the "Algorobillo." The pods of this shrub or small tree are extraordinarily rich in tannic acid; Godeffroy found in the husks 67-68½ per cent. The process of tanning with these pods is accomplished in one-third of the time required for leather from oak-bark; this material is also especially valuable as giving a bloom to the leather. According to Hartwich, noteworthy also for a yellow dye.

Cæsalpinia coriaria, Willdenow.

Wet sea-shores of Central America. Might be naturalised in salt-marshes elsewhere. Prospers as far south as Natal [J. M. Wood]. Colonel Drury states, that each full-grown tree produces annually about 100 lbs. of pods, the husk of which, commercially known as Divi-Divi, is regarded as the most powerful and quickly acting tanning material in India. The mercantile price of the pods is from £8 to £13 per ton. England imports about 4,000 tons annually; the bark is used for tanning. Lac is also gathered from this bush [Dr. G. Watt].

Cæsalpinia crista, Linné.

West-Indies and Carolina. This shrub or tree furnishes a yellow dye-wood.

Cæsalpinia echinata, Lamarck.

Brazil. The Fernambuc-wood or Red Brazil-wood is obtained from this tree and allied species; they also furnish the dye-principle brazilin.

Cæsalpinia Gilliesii, Wallich. (*Poinciana Gilliesii,* Hooker.)

La Plata-States. This beautiful rather hardy bush can be utilized for hedges.

Cæsalpinia pulcherrima, Swartz. (*Poinciana pulcherrima,* Linné.)

Called "The Pride of Barbadoes," but seemingly indigenous to tropical Asia. A large shrub or small tree. This brilliantly ornamental prickly plant is highly adapted for hedges in any climes free of frost. The nesting of ants in its trunk, while the growth continues quite normally, was pointed out already by Roxburgh.

Cæsalpinia Sappan, Linné.

South-Asia. The wood furnishes a red dye, which is largely exported. This shrub can also be adopted as a hedge-plant. The lac-insect has recently taken to it [Watt].

Cæsalpinia sepiaria, Roxburgh.

Southern Asia, east to Japan. There often utilized as a hedge-bush. It can advantageously be mixed for hedge-growth with Pterolobium lacerans (R. Br.), according to Dr. Cleghorn. It furnishes a red dye-wood.

Cæsalpinia tinctoria, Humboldt.

Chili. The bark yields a red dye.

Cæsalpinia vesicaria, Linné. (*C. bijuga,* Swartz.)

West-Indies, on dry savannas and limestone-rocks. This tree furnishes part of the red Fernambuc-wood of commerce, for dye-purposes and select implements.

Cajanus Indicus, Sprengel.*

The Catjang; in Assam called Geeloa-mah, often also Arhar. A shrubby plant of tropical Africa and perhaps Asia, but ascending to 6,000 feet in the extra-tropical latitudes of the Himalayas. One of the up-land varieties will endure a few degrees of frost [C. B. Clarke]. In Jamaica it is cultivated up to 4,000 feet according to Mr. W. Fawcett. On the Richmond River in New South Wales it attains a height of 6 feet. It sustains itself on dry ground, and yields the pulse known as Dhal, Urhur and Congo-pea. The plant lasts for about three years, attains a height of 15 feet, and has yielded in the richest soil of Egypt 4,000 lbs. of peas to the acre. A crop is obtained in the first year. The seeds can be used as peas in the green state as well as when ripe. Two varieties exist, C. flavus, a much smaller plant, yielding less but ripening in 3 or 4 months, and C. bicolor, larger and more prolific, but requiring sometimes 9 months to ripen [Dr. G. Watt]. Even more utilized in India than Phaseolus radiatus and Cicer arietinum. Some of the tribes of Central Africa use the stem of this shrub in friction with reeds, to strike fire, according to Speke. Several species of Cajanus of the Atylosia-section, partly indigenous to the warmer tracts of Australia, might be tested for the sake of the economic value of their seeds. The insect, active in the formation of Lac, lives extensively on the Cajanus, according to Mr. T. D. Brewster, of Assam. Silkworms also live on it.

Cakile maritima, Scopoli.

Europe, North-Africa, North- and South-America, extra-tropical Australia. Not unimportant for aiding to cover drift-sand anywhere on low sea-shores; not hurt by the spray. Regarded as antiscorbutic. In Norway hardy to lat. 71° 7′ (Schuebeler).

Calamagrostis Canadensis, Beauvois.

North-America, extending over the greater portion of the territory on wet ground. Tall and perennial, encouraged rather than cultivated as a nutritious meadow-grass. Much cut on the praries, yielding a heavy crop of hay [Sereno Watson].

Calamagrostis longifolia, Hooker.

North-America. Excellent for fixing drift-sand. C. Epigeios (Roth) and C. Halleriana (De Candolle) serve the same purpose according to Wessely.

Calamintha Nepeta, Hoffmansegg.

From England to the countries around the Mediterranean Sea; fond of limestone-soil. It is strongest in odor among several species, but not of so pleasant a scent as C. incana (Boissier) and C. grandiflora (Moench); closely allied to the following.

Calamintha officinalis, Moench.

Middle and Southern Europe, Middle Asia and Northern Africa. A perennial herb, used like Melissa as a condiment.

Calamus montanus, T. Anderson.

Himalaya, up to 6,000 feet. A hardy climbing palm. The old canes are leafless. The light but strong suspension-bridges, by which the large rivers of Sikkim are crossed, are constructed of this palm. It supplies material for the strongest ropes, to drag logs of wood from the forest. Most durable baskets and rattan-work of chairs are manufactured from the slit stems. Walking sticks and riding sticks, made of this species, are exported from Sikkim in considerable quantity. Many other Calami serve similar purposes, but probably few or perhaps none are equally hardy. Where climatic conditions for culture do not interfere, the famous C. Rotang (Linné) and the very elongated C. latifolius (Roxburgh) have the highest claims for choice of rattans. C. Scipionum (Loureiro) furnishes the Malacca-rattan. Several species of Calamus supply the best dragon's blood.

Callitris arborea, Schrader. (*Widdringtonia juniperoides,* Endlicher.)

Southern Africa, 3,000 to 4,000 feet above sea-level. A middle-sized tree, rich in resin. Occasionally trees of comparatively vast size occur; thus stem girths of 36 feet have been noted, and exceptionally about 1,000 feet of planking were sawn from one tree [G. Sparling].

Callitris calcarata, R. Brown. (*Frenela Endlicheri,* Parlatore.)

Eastern Australia. A tree to 70 feet in height and 3 feet in stem-diameter. Spreads readily over sterile, particularly sandy land. Wood of local importance, strong, durable and of agreeable smell. It is used for piles and furnishes planks for boats; it is repugnant to termites. The knotty portion of the stem particularly valuable to cabinet-makers for inlaying. Market price about £5 per 1000 feet.

Callitris collumellaris, F. v. Mueller.

Eastern Australia, on barren and sandy coast-tracts. Height reaching 100 feet. Timber durable, fine-grained, fragrant, capable of a high polish; used for piles of wharves and sheeting of punts and boats; it resists the attacks of chelura and white ants; the knotty portion valued for veneers. The young stems are liked for telegraph-poles, according to Mr. Thozet. General market value of timber £6 per 1000 superficial feet. [Queensland Exhibition, 1878]. This species exudes sandarac most copiously [J. H. Maiden].

Callitris Mcaleayana, F. v. Mueller. (*Frenela Macleayana,* Parlatore)

New South Wales. A handsome tree, of regular, pyramidal growth, attaining a height of 70 feet; the timber is valuable. C. actinostrobus and C. acuminata from South-West Australia are too small for timber-purposes, but the first-mentioned is one of the very few conifers fit for saline soil.

Callitris Parlatorei, F. v. Mueller.

Southern Queensland. Recommended by Mr. F. M. Bailey as a shade-tree. It attains a height of 60 feet. The wood is esteemed by cabinet-makers. Several other species of Callitris are worthy of forest-culture.

Callitris quadrivalvis, Richard.

North-Africa. A middle-sized tree, yielding the true sandarac-resin. Tables made of the mottled butt-wood fetched fabulous prices already at Plinius's time [J. St. Gardner].

Callitris verrucosa, R. Brown. (*Frenela verrucosa,* A. Cunningham.)

Through the greater part of Australia. Stems used for telegraph-posts [C. Moore]. Wood obnoxious to the generality of insects, hard, heavy, light-colored, pleasantly scented, fit for furniture and flooring. Specific gravity, about 0·691 when dried; weight of a cubic foot, 43 lbs. This tree disseminates itself with great ease in sandy soil, and will succeed in the driest clime, sometimes overpowering most other ligneous vegetation. Planks 2 feet wide can be obtained. Murray Cypress-Pine. Dromedaries, according to Giles, browse on the foliage. Some of the other species are also among the trees, which may be utilised for binding the coast-and desert-sand. They all exude Sandarac. Probably it would be more profitable to devote sandy desert land, which could not be brought under irrigation, to the culture of the Sandarac-cypresses than to pastoral purposes; but boring beetles must be kept off. Stakes and long rails from this tree are much sought. The wood of the closely cognate C. intratropica (F. v. M.) is almost indestructible, not even attacked by Teredo and Termites [M. Holtze].

Calodendron Capense, Thunberg.

Eastern South-Africa. A large and handsome tree, called the Wild Chestnut-tree by the colonists. Particularly fit for promenades. Rate of growth in height at Port Phillip, where it was first brought by the writer, about $1\frac{1}{2}$ foot in a year. Fresh seeds readily germinate.

Calyptranthes aromatica, Saint Hilaire.

South-Brazil. The flower-buds of this spice-shrub can be used almost like cloves, the berries like allspice. Several other aromatic species are eligible for test-culture.

Calyptronoma Swartzii, Grisebach.

West-Indies. A palm, reaching a height of 60 feet. Ascends on tropical mountains to over 3,000 feet elevation. It yields the "long thatch" of Jamaica, the foliage furnishing an amber-colored roofing material, neater and more durable than any other used on that island, lasting twenty years or more without requiring repairs [Jenman]. The generic name Calyptrogyne takes precedence.

Camelina sativa, Crantz.

Middle and Southern Europe, temperate Asia. An annual herb, cultivated for the oil of its seeds. It is readily grown after cereals, yields richly even on poor soil, and is not attacked by aphides. Mr. W. Taylor obtained 32 bushels of seed from an acre, and from this as much as 540 lbs. of oil. The return is obtained within a few months. The seeds serve also as food for many kinds of cage-birds [Dr. Rosenthal]. Hardy in Norway to lat. 70° [Schuebeler].

Camellia Japonica, Linné.

This renowned horticultural plant attains a height of 30 feet in Japan. It is planted there on roadsides for shelter, shade and ornament [Christie]. Out of its elements in the hottest and coldest climes. The wood is used for superior xylography [Dupont]. The seeds, like those of C. Sasaqua (Thunberg), are available for pressing oil. C. reticulata (Lindley) from China is conspicuous for its very large flowers, attaining sometimes 20 inches in circumference. Like C. Japonica it is hardy at Arran, flowering there far more freely [Rev. D. Landsborough]. In England a very large plant of C. reticulata, reared in Mr. Byam Martin's conservatory, had in October, 1848, removed from it 2,600 flower-buds, to allow for April, 1849, about 2,000 flowers to come to perfection [Sir W. Hooker].

Camellia Thea, Link.* (*Thea Chinensis,* Linné).

The Tea-shrub of South-Eastern Asia, said to be indigenous also to some localities of Japan, for instance Surugo, traced as spontaneous as far as Manchuria [Fontanier], also in Yunan, Khasya-

Hills, according to Kurz. This evergreen and ornamental bush has proved hardy in the lowlands at Melbourne, where in exposed positions it endures quite unharmed light night-frosts as well as the free access of scorching summer-winds. But it is in humid valleys, with rich alluvial soil and access to springs for irrigation, that the most productive tea-fields can be formed. The greater the rainfall in any region, otherwise adapted, the richer the yield of the Tea-plant. The plant comes into plentiful bearing of its product as early as the Vine and earlier than the Olive. Its culture is not difficult, and it is singularly exempt from fungus-diseases, if planted in proper localities. Pruning is effected in the cool season, in order to obtain a large quantity of small tender leaves from young branches. Both the Chinese and Assam tea are produced by varieties of a single species, the tea-shrub being indigenous in the forest-country of Assam also. Declivities are best adapted and usually chosen for tea-culture, particularly for Congou, Pekoe and Souchong, while Bohea is often grown in flat countries. In Japan the tea-cultivation extends to 43° north latitude, where the thermometer occasionally sinks to 16° F. [Simmonds], and where in winter-time the ground is frozen several inches deep for weeks [General W. G. Le Duc]. The Chinese variety has withstood the winter of Washington in sheltered positions without protection [W. Saunders]. The Assam variety succumbs to frosts. For fuller details Fortune's work, "The Tea-Districts of China," might be consulted. The very troublesome Tea-bug of Asia is Helopeltis theivora. Fumigation and the application of bird-lime are among the remedies to cope with this insect. The third volume of the Journal of the Agricultural and Horticultural Society of India is mainly occupied by Lieut.-Colonel Edw. Money's and Mr. Watson's elaborate essays on the cultivation and manufacture of tea in India. For more advice on the culture and preparation of tea consult also the writer's printed lecture, delivered in 1875 at the Farmers' Club of Ballarat, further the report of the Commissioner of Agriculture, Washington, 1877, pp. 349-367, with illustrations; also Bernays's Cultural Industries for Queensland, pp. 181-190. Other works dwell also on tea-culture. The tea of commerce consists of the young leaves, merely heated, curled and sweated. The process of preparing the leaves can be facilitated by steam-machinery. Already in 1866 three machines for dressing tea were patented in England—one by Messrs. Campbell and Burgess, one by Mr. Thomson, and one by Mr. Tayse. To give an idea of the quantity of tea, which is consumed, it may be stated, that from June to September, 1871, were shipped 11,000,000 lbs. of tea from China alone to Australia, and that the produce of tea in India from January to June of 1872 was 18,500,000 lbs. The imports into Britain during 1886 were 230,669,292 lbs, valued at £11,317,418. The import into Victoria alone came in 1887 to 14,120,051 lbs., valued at £694,898; while Assam-tea was obtained in India to nearly ninety million lbs. during that year, Ceylon uncounted [J. B. White]. In 1840 India

sent its first small sample of tea to the European market, in 1864 already 7,800,000 lbs, but in 1877 it exported to England forty million pounds, that is, as much as the whole English importation thirty years ago [Burrell]. In 1889 the quantity had risen to above 101,000,000 [Gow, Wilson and Stanton]. Ceylon alone exported already in the commercial year 1882-3 one and a-half million lbs. of tea. According to the Journal of the Society of Arts this had risen to 25,000,000 lbs. in 1888. Of the tea consumed in England in 1889, 50 per cent. came from India, 34 per cent. from China, and 16 per cent. from Ceylon. Dr. Scherzer estimated the Chinese home-consumption at 400,000,000 lbs., others much higher. In 1873 China exported 242,000,000 lbs., Japan, 12,000,000 lbs. Simmonds calculates the area under tea-cultivation in China at 25,000,000 acres. In 1884 Great Britain imported 215,000,000 lbs. of tea, valued at ten and a half million pounds sterling; of this quantity 66,000,000 lbs. came from India, after such a comparatively short time of culture. Three hundred lbs. of prepared tea is the average yield per acre in India, according to Dr. G. Watt. Seeds of the tea-bush are now locally to be gathered in many parts of Australia from plants distributed by the writer since 1859; and for years to come the cultivation of the tea-bush, merely to secure local supplies of fresh seeds, ready to germinate, will in all likelihood prove highly lucrative. Tea contains an alkaloid, coffein, a peculiar essential oil and Boheic acid, along with other substances. Calcareous manures are particularly recommended for tea-plantations. A vast quantity of the germinable seeds of the Chinese tea-shrub was distributed not only locally, but also as far as Queensland, already in 1858 by the writer of this work. In the colony of Victoria Chinese tea can be produced to advantage, but not Assam tea. It is remarkable, that the naturally nearly inodorous tea-leaves should be almost the only kind turned in this direction to account.

Campanula Rapunculus, Linné.

The "Rampion." Middle and Southern Europe, Western Asia, North-Africa. A biennial herb, the root and leaves of which supply a kind of salad during the winter-months in cold climes.

Canavalia gladiata, De Candolle.

Within the tropics of Asia, Africa and America. This perennial climber grows to an enormous height, and bears an abundant crop of large edible beans, which can be used green [Sir Walter Elliott]. It varies with red and white seeds, and in the size of the latter, which are said to be wholesome. In Demerara the young pods are used, boiled like French beans, the nearly ripe seeds like broad beans, and the fully ripe seeds after boiling for mash [Jenman]. C. ensiformis (D.C.) is another variety. C. obtusifolia is decidedly deleterious.

Canna Achiras, Gillies.

Mendoza. One of the few extra-tropic Cannas, eligible for arrowroot culture.

Canna coccinea, Roscoe.

West-Indies. Yields, with some other Cannas, the particular arrowroot called Tous Les Mois.

Canna edulis, Edwards.*

The Adeira of Peru. One of the hardiest of arrowroot-plants. Seeds will germinate even when many years old. Plants, supplied at the Botanic Garden of Melbourne, have yielded excellent starch at Melbourne, Western Port, Lake Wellington, Ballarat and other localities in the colony of Victoria. The Rev. Mr. Hagenauer, of the Gippsland Aboriginal Mission-station, obtained over one ton from an acre; the Rev. Mr. Bulmer found this root to yield 28 per cent. of starch. The gathering of the roots is effected there about April. The plants can be set out in ordinary ploughed land. Starch grains remarkably large. This Canna resembles a banana in miniature, hence it is eligible for scenic plantations; the local production in Gippsland is already large enough to admit of extensive sale. Readily flowering only in hot climes.

Canna flaccida, Roscoe.

Carolina. Probably also available for arrowroot, though in the first instance, like many congeners, chosen only for ornamental culture.

Canna glauca, Linné.

One of the West-Indian Arrowroot-Cannas.

Cannabis sativa, C. Bauhin.*

The Hemp-plant, seemingly indigenous to various parts of Asia as far west as Turkey and as far east as Japan, recorded recently by Dr. A. v. Regel as naturally also wild in Turkestan; A. de Candolle gives Dahuria and Siberia as the native country. Long cultivated for its fibre. It exudes the churras or hasheesh, a medicinal resinous substance of narcotic properties, particularly in hot climates. Spoken of by Herodotus already as highly stimulating and as indigenous in Scythia. Gets to 18 feet high [Fraas]. According to Dr. G. Watt two similar resinous substances are obtained from the Hemp-plant in India, known as ganza and churras, both are smoked; bhang consists of the mature leaves, used in the preparation of the intoxicating beverage called hashish. The foliage also contains a volatile oil, while the seeds yield by pressure the well-known fixed hemp-oil, for which they are extensively produced, particularly in Russia. Usually the plant is pulled for obtaining fibre in its best state immediately after flowering; the seeding plant is gathered for fibre at a later stage of growth.

Good soil well-drained, never absolutely dry, is needed for successful hemp-culture. Hemp is one of the plants yielding a full and quick return within the season, the period of vegetation being from 90 to 105 days. The return may be from 4 cwt. to 10 cwt. per acre. The average summer-temperatures of St. Petersburg (67° F.) and of Moscow (62° F.) admit still of the cultivation of this plant. The Hemp-plant serves as a protection against insects on cultivated fields, if sown along their boundaries. The seeds are sometimes used in medicine, and are a favorite fodder for various cage-birds. The importations of Hemp into the United Kingdom in 1884 were 1,335,000 cwt., worth over two million pounds sterling. Victoria imported in 1887 about 1,000 tons. The total annual production of Hemp is from seven to eight million cwt. The Hemp-plant succeeds well also in the tropical coast-regions of Australia.

Canella alba, Murray.

West-Indies and Florida. An evergreen tree, to 50 feet high, aromatic in all its parts; the bark particularly used, less in medicine than as a condiment.

Cantharellus edulis, Persoon. (*C. cibarius,* Fries.)

The Chantarelle. Various parts of Europe, occurring also in South-Eastern Australia and some other parts of the globe. Dr. Goeppert mentions this among the many mushrooms, admitted under Government-supervision for sale in Silesia.

Capparis sepiaria, Linné.

From India to the Philippine-Islands, ascending to cool elevations and living in arid soil. A prickly-bush, excellent for hedges. Dr. Cleghorn mentions also as hedge-plants C. horrida (L. fil.), C. aphylla (Roth), C. Roxburghii (D.C.), some of which also yield capers.

Capparis spinosa, Linné.

The Caper-Bush. Southern Europe and Northern Africa, Southern Asia and Northern Australia. A somewhat shrubby and trailing plant, deserving already for the sake of its handsome flowers a place in any garden. It sustains its life even in arid deserts. Light frosts do not destroy this plant; the soil requisite for greatest productiveness should be of calcareous clay. The flower-buds and young berries, preserved in vinegar with some salt, form the capers of commerce. Samples of capers, prepared from plants of the Botanic Garden of Melbourne, were placed already twenty years ago in our Industrial Museum, together with many other products, emanating from the writer's laboratory. The Caper-plant is propagated either from seeds or suckers or cuttings; it is well able to withstand either heat or drought. The buds, after their first immersion in slightly salted vinegar, are strained and afterwards

preserved in bottles with fresh vinegar. In sheltered plains of Provence annually about 1,760,000 lbs., worth at an average 7d. per pound, are collected. The shrub comes into full bearing at the fifth year, the harvests continuing well for many years afterwards [Masters]. Chemical principle: Rutin.

Capsicum annuum, Linné.

Central America. An annual herb, which yields the Chilies, and thus also the material for cayenne-pepper. The fruits of the large carnulent variety are consumed like those of the egg-plant. Chemical principle: the acrid, soft-resinous capsicin. Comes to seeding in Christiania still. The seeds will keep for several years.

Capsicum baccatum, Linné.

The Cherry-Capsicum. A perennial plant. Brought from Brazil to tropical Africa and Asia, where other pepper-capsicums are likewise now naturalised.

Capsicum frutescens, Linné. (*C. fastigiatum,* Blume.)

Tropical South-America. The berries of this shrubby species are likewise converted into cayenne-pepper.

Capsicum longum, De Candolle.

Some of the hottest parts of America. An annual herb, also yielding cayenne-pepper. C. grossum (Willd.) is also mentioned by Colonel Drury as a pungent species. The summers of the warm temperate zone admit of the successful growth of at least the annual species of Capsicum in all the lowlands. C. humile binds sand even when brackish.

Capsicum microcarpum, De Candolle.

South-America. It is this species, which is used by preference in Argentina. There are annual and perennial varieties.

Caragana arborescens, Lamarck.

The Pea-tree of Siberia, reaching to 70° North. The seeds are of culinary value, but particularly used for feeding fowls. The leaves yield a blue dye [Dr. Rosenthal].

Carex arenaria, Linné.

Western Europe and Northern Asia. Hardy to lat. 62° 30′ in Norway [Schuebeler]. One of the most powerful of sedges for subduing rolling sand, its rigid foliage not attracting grazing animals. The roots are of medicinal value.

Carex Moorcroftiana, Falconer.

The Loongmur of the Alps of Thibet. One of the best of sedges for fixing the shifting sand by its deeply penetrating and creeping

roots. It forms an intricate net-work on the surface and beneath. Outliving most other fodder-plants at its native places, it becomes available for cattle- and horse-food—particularly in the cold of winter, and is held to be singularly invigorating to pasture-animals.

Carex pumila, Thunberg.

Eastern Asia and Australia, New Zealand and South-America. Helps to bind the coast-sand there.

Carica Candamarcensis, Morren.

Andes of Ecuador up to an elevation of about 9,000 feet [Prof. Jameson]. A small slender tree. Fruit to nine inches long and sometimes nearly as broad, edible and wholesome, of delicious scent and grateful taste [Sir Jos. Hooker]. Other large-fruited Caricas occur in andine regions, comprised under the vernacular name Camburu [Spruce]. Their cultural rearing seems possible in frostless regions only. Fruit used raw or cooked.

Carica Papaya, Linné.

West-Indies and Mexico to Peru. Cultivated northward still in some parts of Florida, elsewhere to 32° N. [A. de Candolle]. The Papaw-tree. A small often branchless tree of short vitality, only fit for regions not subject to frost. Bears enormously in Eastern sub-tropic Australia, producing fruits occasionally of 4 lbs. weight near Keppel-Bay [J. S. Edgar]. Fruit generally of the size of a small lemon; eaten boiled or preserved in sugar or pickled in vinegar [Sir James Smith]. Fresh seeds germinate readily. The acrid milky juice of the tree, much diluted with water, renders any tough meat, washed with it, tender for cooking purposes by separating the muscular fibres [Dr. Holder]. Merely wrapping the meat in the Papaw-leaves will often suffice. Drs. Boucher and Wurtz have successfully introduced the Papaya-sap against Diphtheria; further the juice has been administered as a vegetable pepsin and as an anthelmintic. Dr. Th. Belgrave has pointed out the great importance of this plant as a galactogogue. Fruits ripen successively.

Carissa Arduina, Lamarck.

South-Africa. A shrub with formidable thorns, well adapted for boundary-lines of gardens, where rapidity of growth is not an object. Quite hardy at Melbourne. C. ferox (E. Meyer) and C. grandiflora (A. de Cand.) are allied plants of equal value. The fruit of the latter is largely used for jam and as such quite wholesome [Bernays]. The East-Australian C. Brownii (F. von Mueller) can be similarly utilised. The flowers of all are very fragrant. C. Carandas (Linné) extends from India to China; its berries are edible; it is also a strong hedge-plant.

Carludovica palmata, Ruiz and Pavon.

Central America, up to over 3,000 feet. Methodically cultivated for the sake of its fan-like leaves, which furnish the material for Panama-hats. Holds a cultural position as far south as Moreton-Bay (Fr. Turner).

Carpinus Americana, Michaux.

The Water-Beech or Ironwood of North-America, thriving best on the margins of streams. The wood is fine-grained, tough and compact, used for cogs of wheels and any purpose, where extreme hardness is required, such as yokes [Robb]. It is often speckled and somewhat curled, thus fitted for superior furniture [Simmonds]. C. Caroliniana (Walter) is the oldest name. Very closely allied to the following.

Carpinus Betulus, Linné.

The Hornbeam. Middle and Southern Europe and Western Asia. A tree to 80 feet high. Wood pale, of a horny toughness and hardness, close-grained but not elastic. It is used for wheel-wrights' work, for cogs in machinery and for turnery [Laslett], also for a variety of implements, for wooden shoes, and particularly for hat-blocks, also for walking-sticks. It furnishes a good coal for gunpowder. The inner bark serves for a yellow dye. This tree would tend to arrest the progress of bush-fires, if planted in copses or hedges, like willows and poplars, around forest-plantations. In Norway it is hardy to lat. 63° 26′ [Schuebeler]. Four species occur in Japan: C. cordata, C. erosa, C. laxiflora and C. Japonica (Blume). Carpinus viminea (Wallich) is a species with durable wood from the middle regions of Nepal.

Carthamus tinctorius, Linné.

From Egypt to India. The Safflower. In Norway grown to lat. 70° 22′ North. A tall, annual, rather handsome herb. The florets produce yellow, rosy, ponceau and other red shades of dye, according to various admixtures. Pigment-principles: carthamin and carthamus-yellow. For domestic purposes it yields a dye ready at hand from any garden. In India the Carthamus is also cultivated for the sake of the oil, which can be pressed from the seeds. Poultry fatten on the seeds.

Carum Ajowan, Bentham. (*C. Copticum,* Bentham.)

From the countries around the Mediterranean Sea to India. The fruits of this annual herb form an excellent culinary condiment with the flavor of thyme. Its peculiar oil is accompanied by cymol and thymol.

Carum Bulbocastanum, Koch. (*Apium Bulbocastanum,* Caruel; *Bulbocastanum Linnaei,* Schur.)

Middle and South-Europe, North-Africa, Middle Asia, on limestone soil, extending in Cashmere to 9,000 feet elevation. The tuberous roots and also the leaves serve as a culinary vegetable, the fruits as a condiment.

Carum Capense, Sonder.

South-Africa, where the edible, somewhat aromatic root is called Fenkelwortel.

Carum Carui, Linné. (*Apium Carui,* Crantz.)

The Caraway-Plant. Perennial. Europe, Northern and Middle Asia. Extends in Norway to lat. 71° 7′. A wholesome adjunct, if interspersed among the herbs of sheep-pastures. It might be naturalised even on our alps, and also along the sea-shores. The Caraway-oil is accompanied by two chemical principles: carven and carvol. Among the many purposes for which it is employed is that of entering into the scents of soaps and cheap essences of perfumery [Piesse]; still more used in the preparation of some liqueurs. The seeds will keep three years [Vilmorin]. On rich soil, in Essex, as much as 20 cwt. seeds on an acre have been produced [G. Don]. Royle mentions two varieties or allied plants from Upper India.

Carum ferulifolium, Koch. (*Bunium ferulifolium,* Desfontaines.)

A perennial herb of the Mediterranean regions. The small tubers are edible.

Carum Gairdneri, Bentham.

Western North-America, particularly in the Sierra Nevada. A biennial herb, the tuberous root of which furnishes an article of food as well as the root of the allied Californian C. Kelloggii (A. Gray). Geyer probably had this plant in view, when he mentions the tubers of an umbelliferous plant, which are among the dainty dishes of the nomadic Oregon-natives. The truly delicious root bursts on being boiled, showing its snowy white farinaceous substance, which has a sweet cream-like taste, and somewhat the aroma of parsley-leaves [Lindley].

Carum incrassatum, Boissier. (*Bulbocastanum incrassatum,* Lange.)

The "Talmuda." Spain, Morocco, Algier. This herb produces fair-sized tubers, which are tender and floury, and consumed by the aboriginal Algerians either raw or roasted or boiled. Prof. Naudin thinks, that these tubers could be so improved by cultivation as to become available as a table-esculent.

Carum Petroselinum, Bentham.* (*Apium Petroselinum,* Linné.)

The Parsley. South-Europe, North-Africa and Orient. This biennial, well-known culinary herb is always desirable on pastures, also as a preventive or curative of some kidney-and-liver-diseases of sheep, horses and cattle. In Norway it is hardy to lat. 70° [Schuebeler]. The root of a particular variety is also valuable for the table. Vilmorin mentions that the seeds (or fruitlets) will keep fully three years. Rev. H. Kempe found the seeds to mature well in the gardens of Central Australia. The plant was much used for garlands and wreaths in ancient times [Dr. Schweinfurth]. The essential oil of the fruits contains a peculier stearopten. Mr. J. W. Fedaro had individual plants of a very curly variety growing uninterruptedly for nineteen years without seeding; pieces taken from them grow readily, continuing the variety.

Carum Roxburghianum, Bentham.

Southern Asia, where it is extensively cultivated for curries, particularly in North-Western India [Atkinson].

Carum segetum, Bentham. (*Anethum segetum,* Linné.)

Around the Mediterranean Sea, extending to Western Europe. An aromatic annual herb, available for culinary purposes.

Carya alba, Nuttall.*

The Shagbark-Hickory and Shellbark-Hickory also. Eastern North-America, extending to Canada and Carolina. Professor Schuebeler found it to be hardy in Norway to lat. 63° 52. A deciduous tree, reaching a height of 90 feet; it delights in rich forest-soil. Wood heavy, strong, elastic and tenacious, but not very durable; used for chairs, agricultural implements, carriages, baskets [Sargent], whip-handles and a variety of other purposes. Yields the main supply of hickory-nuts. All the hickories are extensively used in North-America for hoops. Circumference of stem 2 feet above ground 30 inches after 24 years at Nebraska [Furnas].

Carya amara, Nuttall.

The Bitternut-Tree or Swamp-Hickory. Eastern North-America, extending to Georgia and Texas. A tree, sometimes 80 feet high. Replacing C. alba on low wet ground [B. E. Fernow]. Wood less valuable than that of other hickories. Richest of all North-American trees in potash, in which most hickories abound. Hardy at Christiania. The flowers of all the Caryas yield much honey [Damkoehler].

Carya glabra, Torrey.* (*Carya porcina,* Nuttall.)

The Hognut-Tree. Eastern North-America, reaching Canada and Florida. Often to 80 feet high; sometimes over 100, with a circumference of 12 feet at 5 feet from the ground [Prof. Meehan].

Wood very tough; the heart-wood reddish or dark-colored; much used for axle-trees and axe-handles, and particularly for wooden shoes. Rate of stem-growth in Nebraska, 38 inches circumference in 24 years [Nuttall].

Carya microcarpa, Nuttall.

The Balsam-Hickory. Eastern North-America. A fine lofty tree, attaining a height of 80 feet, with a stem 2 feet in diameter. The wood is pale and tough, and possessed of most of the good qualities of C. tomentosa, to which this species is also in other respects allied. Also very closely related to C. alba. The nut is of pleasant taste, but small [Nuttall].

Carya oliviformis, Nuttall.*

The Pacan or Pecannut-Tree of Eastern North-America, extending to Texas. A handsome tree, reaching 70 feet in height, with a straight trunk. The most rapid growing of all the hickories. It needs deep rich soil of valleys [B. E. Fernow]. Its wood is coarse-grained, heavy and compact, possessing great tenacity; in strength and elasticity it surpasses even that of the White Ash [Harrison]. The nuts are usually abundant, and the most delicious of all walnuts; they form an article of considerable commerce in the Southern States. Texas annually exports nuts to the value of over £10,000 [Dr. C. Mohr]. The tree matures fruits as far north as Philadelphia. It commences to bear in about ten years. The fresh nuts should be packed in dry moss or sand into casks for distant sowings. The kernel is extremely oily, thus the fruit does not keep so well as the ordinary walnut. Although the wood of all the hickories is not well adapted for building purposes, as it is subject to the attacks of insects and soon decays if exposed to the weather, yet its great strength and elasticity render it extremely useful for implements, articles of furniture, hoops and many minor purposes, besides supplying locally the very best of fuel. Hickories, even when very young, do not well bear transplanting, C. amara perhaps excepted. C. alba and C. glabra would be particularly desirable for the sake of their timber, and C. oliviformis on account of its fruit. The bark of all the hickories contains yellow dye-principles; by the addition of copperas an olive color is produced; by the addition of alum, a green color. Hickory stems are known to attain 12 feet in girth.

Carya sulcata, Nuttall.*

The Furrowed Hickory and the Shellbark-Hickory of some districts; also one of the Shagbark-Hickories. North-America, in the Eastern States. A tree, to 80 feet high in damp woods. Its rate of growth is about 18 inches in a year, while young. Heart-wood pale-colored. Seed of sweet pleasant taste. Wood similar to that of C. alba, but paler. The tree is still hardy in Christiania.

Carya tomentosa, Nuttall.*

The Mockernut-Tree or White Heart-Hickory. Eastern North-America, extending to Canada, replacing C. alba on drier and poorer ground [B. E. Fernow]. A large tree; likes forest-soil, not moist. Heart-wood pale-colored, remarkable for strength, elasticity, heaviness and hardness, yet fissile; used for axles, spokes, felloes, handles, chairs, screws, sieves and the best of mallets; the saplings for hoops and wythes. Hickory is the most heat-giving amongst all North-American woods. Nut small, but sweet; very oily. A variety produces nuts as large as a small apple, which are called King-Nuts.

Caryota urens, Linné.

India. One of the hardier Palms, ascending the Himalayas to an altitude of 5,000 feet, according to Dr. Thomas Anderson, yet even there attaining a considerable height, though the temperature sinks in the cooler season to 40° F. Drude mentions, that species of this genus ascend to an elevation of 7,500 feet, where the temperature occasionally approaches the freezing point. The trunk furnishes a sago-like starch. This palm only flowers at an advanced age, and after having produced a succession of flowers dies away. From the sap of the flower-stem, just as from that of the Cocos- and Borassus-Palm, toddy and jaggeri-sugar are prepared, occasionally as much as 12 gallons of liquid being obtained from one tree in a day. The fibre of the leaf-stalks, known as "Kitton," can be manufactured into very strong ropes, also into baskets, brushes and brooms. It also serves the Indian races as tinder. The outer wood of the stem answers for turnery. Several allied species exist, one extending to North-Eastern Australia.

Casimiroa edulis, Llav and Levarz.

Mexico, up to the cool heights of 7,000 feet. This finally tall tree comes into bearing in about ten years. The kernel of its fruit is deleterious [Hernandez], but the pulp of a delicious, melting, peach-like taste [Garner], partaking of which is said to induce sleep. The tree thrives well in a clime like that of Santa Barbara, California [Capt. E. Cooper], and proved also hardy in Provence [Prof. Naudin]. The fruit is from 1 to 4 inches in diameter, pale yellow, of a rich subacid taste, and most palatable when near decay [Dr. Seemann]. Efforts to propagate it from cuttings were not successful, and seeds do not seem to reach perfection in California [Calif. Hortic. Magaz. 1880]. Attains a great age.

Cassia Absus, Linné.

Intra-tropical regions of the eastern hemisphere. The seeds are since ancient times in Egypt used to produce a counter-inflammation of fermentive growth in various forms of eye-diseases, particularly pannus [Dr. Schweinfurth].

Cassia acutifolia, Delile.

Indigenous or now spontaneous in Northern and Tropical Africa and South-Western Asia. Perennial. The leaflets merely dried constitute part of the Alexandria-and also Tinnevelly-senna. The active principle of senna—namely, cathartic acid—occurs also in the Coluteas and in Coronilla varia, according to C. Koch. The senna-cassias have within Australia particularly well succeeded in the Eastern sub-tropical coast-regions.

Cassia angustifolia, Vahl.

Northern and Tropical Africa and South-Western Asia, indigenous or cultivated. Perennial. Yields Mecca-senna, also the Bombay- and some of the Tinnevelly-senna.

Cassia artemisioides, Gaudichaud.

Sub-tropical and extra-tropical Australia. The species of this series of the genus are shrubby, and considered valuable for arid and sandy sheep-runs as affording feed. They brave intense heat, and are adapted for rainless regions.

Cassia fistula, Linné.

Southern Asia. The long pods of this ornamental tree contain an aperient pulp of pleasant taste and of medicinal value. It is also used in the manufacture of cake-tobacco. Traced by Sir Jos. Hooker to the slopes of the Central Himalayas.

Cassia Marilandica, Linné.

An indigenous senna-plant of the South-Eastern United States of North-America. Perennial.

Cassia obovata, Colladon.

South-Western Asia; widely dispersed through Africa as a native or disseminated plant. Perennial. Part of the Alexandra-senna and also Aleppo-senna is derived from this plant; less esteemed and less collected than the other species. It furnishes also Italian, Tripolis, Senegal and Tanacca senna.

Castanea sativa, Miller.* (*C. vulgaris,* Lamarck; *C. vesca,* Gaertner.)

The Sweet Chestnut-tree. South-Europe and Temperate Asia, as far as Japan, where a variety with larger fruits is cultivated, a variety with smaller fruits extending to North-America. Professor Schuebeler records that even in Norway at latitude 58° 15′ a chestnut-tree attained a height of 33 feet with a stem 4 feet in circumference; in a shrubby state it is found as far north as 63°. It reaches an enormous age; at Mount Etna a tree occurs with a stem 204 feet in circumference. At other places trees are found 10 feet in diameter, solid to the centre. The tree does not readily admit of transplantation; likes granitic soil. It bears still in the low

country of Southern Queensland fairly well. The wood is light, cross-grained, strong, elastic and exceedingly durable, well adapted for staves and wheel-cogs, ornamental carving, the young wood for hoops and mast-rings, also for walking-sticks. The wood is comparatively rich in tannic acid (about 4 to 6 per cent.), and hence used for preparing a liquid extract; the bark contains 12 per cent. tannin [Wiesner]. The leaves furnish food for the Bombyx Jamamai [Dupont]. The greatest importance of the tree rests on its adaptability for shade-plantations, its nutritious nuts and timber value. The American wood is slightly lighter in color than that of the Red Oak, and available for shingles and rails; chestnut-rails in North-America have lasted for half a century. The wood is beautifully laminated [Simmonds], and largely employed for furniture, for the inside finish of railroad-cars and steamboats [Vasey]. The American nuts are smaller, but sweeter than the European; they are largely used for fattening hogs [Robb]. Rate of stem-growth in Nebraska, 24 inches in 14 years, diametrically [Furnas]. The total production of chestnuts merely in Italy during 1886 was 391,393 tons. Bees carry off the pollen.

Castanopsis argentea, A. de Candolle.

A lofty tree in the mountains of India. Produces also edible chestnuts. Other species of the genus Castanopsis are valuable, thus according to the Rev. B. C. Henry the nuts of the Chinese C. jucunda (Hance) are edible.

Castanopsis chrysophylla, A. de Candolle.

The Oak-Chestnut of California and Oregon. A tree, attaining a height of 150 feet and 8 feet in stem-diameter. Either for beauty or utility worthy of cultivation [Dr. Gibbons]. The leaves are golden-yellow underneath. Wood durable, highly prized by joiners, wheel-wrights and even shipbuilders [Dr. Kellogg].

Castanopsis Indica, A. de Candolle.

Mountains of India, at about 4000 feet. This Oak-Chestnut produces seeds with the taste of filberts.

Castilloa elastica, Cervantes.*

Central America, but hardy and fruiting in Florida [Th. Mead]. This tree yields India-rubber of a good kind.

Casuarina Cunninghami, Miquel.

Eastern Australia, particularly along river-banks. Attains a maximum-height of 100 feet. The wood is used for yokes, tools, shingles and various other purposes. The foliage is much liked by pasture-animals [A. R. Crawford].

Casuarina Decaisneana, F. v. Mueller.

Central Australia, where it is the only species of the genus. Traced by Lieut. Dittrich into Queensland. The tree is one of the largest among its congeners and particularly valuable for arid sandy regions. The wood is exceedingly hard, and resists the attacks of termites and also decay; the stem-wood is straight and easily fissile [Rev. H. Kempe]. Dromedaries delight in getting the branchlets of this tree for food [E. Giles].

Casuarina distyla, Ventenat.

Extra-tropical Australia. A shrubby species, well adapted for fixing the sand-drifts of sea-coasts. All Casuarinas can be pollarded for cattle-fodder.

Casuarina equisetifolia, Forster. (*C. litorea,* Rumph).

Eastern Africa, Southern Asia, tropical and sub-tropical Australia, Polynesia. Thrives permanently much better than Eucalyptus globulus in Lower Egypt according to Dr. Schweinfurth. Attains a maximum-height of 150 feet. Splendid for fuel, giving great heat and leaving little ashes. The timber is tough, nicely marked. The tree will live in somewhat saline soil at the edge of the sea. Colonel Campbell-Walker estimates the yield of firewood from this tree as four times as great as the return from any tree of the forests of France. Known to have grown in 10 years to a height of 80 feet, but then only with a comparatively slender stem [Blechyndon]. In India the wood is much used as fuel for railway-locomotives; the tree is there also extensively employed to reclaim sand-land of the coast, it succeeding in growth down to high water-mark, throwing often out decumbent branches, which develop roots, further to fix the sand and to throw up independent shoots [Dr. Bidie]. It yields a lasting wood for piles of jetties, for posts and for underground-work, and is much used for knees of boats and for tool handles [Wilcox]; it is very heavy and singularly dark. The cost of raising Casuarinas in India has been from £4 to £10 per acre, and the return, after only eight years, £13 to £32.

Casuarina Fraseriana, Miquel.

South-Western Australia. A middle-sized tree; the wood easily split into shingles. The best furniture-wood of South-Western Australia, as it does not rend. This tree is adapted even for sterile heath-land.

Casuarina glauca, Sieber.

Widely distributed through South-Eastern Australia, even in desert-country, but nowhere forming forest-like masses. This species attains in favorable places a height of 80 feet. Its hard durable wood is valuable; used for staves, shingles and various utensils [Woolls]. Important for its rapid growth, for its resistance

to exposure, for shelter-plantation and for speedy supply of fuel,—a remark which applies to the following species also. Much liked for food by dromedaries [Sir Th. Elder].

Casuarina quadrivalvis, La Billiardière.

The Coast-Sheoak of South-Eastern Australia. Not living merely in coast-sand, but also on other barren places, reaching the inland-hills. Attains a height of 60 feet. The foliage of this species is drooping. The male tree is very eligible for avenues, but the female less slightly. Cattle are fond of the foliage; indeed it is a "stay-by" to all kinds of stock in drought, branches then being lopped from the trees for feed. For arresting the ingress of coast-sand by belts of timber this is one of the most important trees. It produces seed early and copiously like other Casuarinas, and is easily raised. Weight of a cubic foot of dry wood from 58·3 to 64·3 [Rummel]. The foliage, like that of the other species, is acidulous from a crystallisable substance allied to bicitrate of lime. The chewing of it allays thirst.

Casuarina suberosa, Willdenow.

The erect-branched Sheoak of South-Eastern Australia. Height reaching 40 feet. A beautiful shady species. Casuarina trichodon (Miq.) and C. Huegeliana (Miq.) are aboreous species of South-Western Australia, valuable for their wood.

Casuarina torulosa, Aiton.

New South Wales and Queensland. Attains a height of 70 feet. The tough wood of this handsome tree is in demand for durable shingles and furniture-work, as well as for staves and veneers; it is also one of the best for oven-fuel.

Catalpa bignonioides, Walter.

Southern States of North-America, extending to Illinois. A tree of rapid growth in warm humid climates, attaining a height of about 20 feet in four years. Professor Meehan observed the stem to attain a diameter of 4 feet in twenty years, even in the latitude of New York. Rate of growth in the clime of Nebraska, as recorded by Governor Furnas, considerably less. In many parts of the United States it is a favorite tree for shade-lines. When closely planted it will grow tall and straight, with a stem fully 50 feet to the first branch. It prefers bottom-lands, but will succeed in almost any soil and position, according to Mr. Barney. It is hardier than most Eucalypts, but will not stand severe frosts. According to Professor Burrill, it is not liable to be destroyed by insects; bears seeds when quite young. Professor Meehan considers the wood to be as durable as that of the best Chesnut-trees; indeed it lasts for an almost indefinite period. General Harrison insists, that there is nothing like it for posts. Catalpa-pickets of the old French stockade are still sound. Logs thrown across water-courses for crossing have lasted for three

generations; railway-posts and platforms of this wood are almost indestructible. Logs a century old, and posts half a century old, were not in the least decayed [Barney]. Railway cross-ties made of this wood are also very durable, a tree twenty years old furnishing sufficient timber for four ties. Canoes of Catalpa-wood never crack or decay.

Catalpa Kaempferi, Siebold and Zuccarini.

Japan. Grows in eight years to about 25 feet in height, with a trunk of 2 feet circumference; bunches of flowers very large and fragrant [Hovey]. Proved hardy at Christiania [Schuebeler]. C. Bungei (Meyer) from North-China, or a closely allied species, can be grown for hedges. Flowers of all Catalpas sought by bees.

Catalpa speciosa, Warder.

In the Mississippi-States. Hardier and taller than C. bignonioides; blooming earlier; leaves inodorous, flowers larger, growth as rapid and wood as durable; also only with a very thin layer of destructible sapwood [Dr. Engelmann]. Found to have attained in 40 years a stem-circumference of 40 feet at 4 feet from the ground [Letterman].

Catha edulis, Forskael.

Arabia and Eastern Africa. The leaves of this shrub, under the designation of Kafta or Cath, are used for a tea of a very stimulating effect, to some extent to be compared to that of Erythroxylon Coca. To us the plant would be mainly valuable for medicinal purposes.

Caulanthus procerus, Watson.

California. A stout biennial. Locally used as a substitute for cabbage [Brewer], but here only mentioned as likely capable of cultural amelioration.

Ceanothus rigidus, Nuttall.

California. One of the best of hedge-shrubs, available for dry situations. Evergreen; to 12 feet high; the branches becoming densely intricate. In the coast-tracts it is replaced by C. thyrsiflorus (Escholtz), which can also be used for hedges and copses, and will live in mere coast-sand. C. prostratus (Bentham) forms natural mats on slopes, made by roads and slides, which it gradually covers, and with its preetty blue flowers soon decorates [Professor Bolander]. Irrespective of their beauty, the different species are worthy of cultivation as forming excellent wind-breaks. A fair tea is made from the leaves of C. velutinus [Dr. Gibbons]. Some species are relied on as forage-plants.

Cedrela Australis, F. v. Mueller.*

Eastern Australia, as far south as 36°. The Australian Red Cedar or Cedrel. Foliage deciduous in cool regions. Attains a height of 200 feet and sometimes a stem-girth of 18 feet near the base. Messrs. Danger and Name measured a tree on the Macleay-River, 48 feet in stem-circumference at 10 feet from the ground: it yielded 80,000 feet of sound timber. Rev. Dr. Woolls noted also in New South Wales trees so large as to yield 30,000 feet (superficial) of timber. Market-value in Brisbane £7 10s. to £8 10s. per 1,000 superficial feet. The light, beautiful wood is easily worked and susceptible of high polish; it is very much in request for furniture, for turnery including stethoscopes, for the manufacture of pianofortes, for boat-building, frames of window-blinds and a variety of other joiners' work; thus it is highly prized for building racing boats, which weigh little over 30 lbs., though 30 feet long, and yet prove durable [S. Edwards]. The timber from the junction of the branches with the stem furnishes choice veneers. Altogether the wood is much less liable to be bored by insects than most others. The bark contains a considerable quantity of tannin, which produces a purplish leather [Fawcett]. This tree is hardy at Melbourne, but of slow growth in open exposed gardens and poor soil there.

Cedrela Bogotensis, Triana and Planchon.

New Granada, ascending to 8,500 feet, therefore unusually hardy. The timber of this tree is there most extensively in use [Prof. Sodiro].

Cedrela fissilis, Vellozo. (*C. Brasiliensis,* A. de Jussieu).

From Argentina extending to Mexico. The timber is soft, fragrant and easily worked; it is known as Acajou-wood. The Surinam Cedar-wood is furnished by C. Guianensis (A. de Jussieu), the Peruvian kind by C. angustifolia (De Candolle), the Caracas sort by C. montana (Turczaninow), the Argentine from C. Paraguensis (Martius).

Cedrela febrifuga, Blume.*

Java, Sumatra, Timor, in cooler mountain-regions. More closely allied to C. Australis than to C. Toona. A tree, rising finally to a height of 200 feet. Bark of tonic property. Hasskarl further notes from Java C. Teysmanni and C. inodora. Cedrelas occur also in New Guinea.

Cedrela odorata, Linné.

Mexico, Antilles, Guiana, in Jamaica up to 4,000 feet elevation [W. Fawcett]. A comparatively tall tree, easily cultivated. It succeeds as far south as Natal [J. M. Wood]. Wood light, of pleasant odor, easily worked, preferentially chosen in its native country for cigar-boxes and a variety of other articles, also furniture. The tree exudes the aromatic Acajou-resin like C. fissilis.

Cedrela serrata, Royle.

India. Ascending to higher elevations than C. Toona, indeed to 8,000 feet. Seeds with a membranous appendage on one side only.

Cedrela Sinensis, A. de Jussieu.*

China and Japan. An elegant tree, hardy in South-Europe. It furnishes a wood not unlike that of the Singapore-cedar, reddish in color, particularly sought for cigar-boxes and similar articles. Foliage of a rosy hue in spring.

Cedrela Toona, Roxburgh.*

The Singapore-cedar. Southern India. Foliage deciduous. One of the most important of all timber-trees for furniture-wood, which is easily worked, light, seasons readily, takes polish well and is applicable for a multitude of purposes in joinery, also used for tea-chests, It is durable and not eaten by termites. Dr. Brandis gives the stem-girth of trees 35 years old as 7 feet, when the tree grew on rich and moist soil; trees with 30 feet stem-circumference are known. Seeds with membranous appendages on both sides. C. glabra and C. microcarpa (C. de Candolle) yield partly the Sikkim Cedar-wood.

Cedrela Velloziana, Roemer.

Brazil. A magnificent tree, with odorous wood of a red hue.

Cedronella cordata, Bentham.

Southern States of North-America. A perennial herb, fragrant like the following.

Cedronella triphylla, Moench.

Madeira and Canary-Islands. A shrubby plant with highly scented foliage. The volatile oil obtainable from it resembles that of Melissa, but is somewhat camphoric.

Celtis Australis, Linné.

The Lotus-tree of South-Europe, North-Africa and South-Asia, ascending the Himalayas to 9,000 feet. Attains a height of about 50 feet. Though of rather slow growth, this tree can be used for avenues, as its stem finally attains to 6 feet in diameter. It is supposed, that this Celtis reaches the age of fully 1,000 years. Berries edible. Wood hard and dense, eligible particularly for turners' and carvers' work. Used also by instrument-makers for flutes and pipes. The stem-wood is fine-grained, easily cleft, and of a splendid yellow tinge; the branch-wood is one of the best for whip-sticks. Largely planted for fodder in India [Dr. G. Watt]

Celtis occidentalis, Linné.

The Hackberry-tree. Eastern States of North-America. Height reaching to 80 feet. Will grow tolerably well even on the poorest soil [B. E. Fernow]. Hardy as far north as Christiania. The sweet fruit edible. Wood rather soft, difficult to split.

Celtis Sellowiana, Miquel.

Argentina. Tree to 40 feet high. Wood strong, used chiefly for wagons, posts, turnery. Fruit edible [Hieronymus].

Celtis Sinensis, Persoon. (*C. Japonica,* Planchon.)

China and Japan. The "Henoki." A tree, bearing extreme cold. Wood useful for carpenters' and turners' work. Fruit edible but small.

Celtis Tala, Gillies.

From Texas to the La Plata-States. A thorny shrub, or under favorable circumstances a good-sized tree. This plant can be used for forming impenetrable hedges, but also shade-avenues. One or two other Argentine species serve the same purposes.

Cephaelis Ipecacuanha, Richard.

Brazil, in mountain-woods, consociated with Palms and Tree-ferns. It is not unlikely that this herb, which is perennial and yields the important medicinal ipecacuanha-root, would live in warm extra-tropic forest-regions. Active principles: emetin and ipecacuanha-acid. Ipecacuanha has in some cases proved efficient also in snake-poison. The plant is best propagated from root-cuttings.

Cephalanthus occidentalis, Linné.

North-America, extending to Canada and Mexico. A tree, attaining a height of about 50 feet on streams, easily disseminated, flowering profusely already in a shrubby state, more important for ornamental than for industrial growth, admitted here however as a rich yielder of honey from its fragrant flowers, which last through several months. The bitter bark, particularly that of the root, used therapeutically [Dr. Kellogg]. The plant was introduced first by the writer into Victoria, where it thrives to perfection.

Cephalotaxus drupacea, Siebold and Zuccarini.

China and Japan. This splendid Yew attains a height of 60 feet and is very hardy. According to Dr. Masters, the C. Fortunei (Hooker) is merely a variety. A small congener, C. Mannii (J. Hooker), occurs in the Khasia-Mountains.

Ceratonia Siliqua, Linné.

The Carob-Tree, indigenous to the Eastern Mediterranean regions. It attains a height of 50 feet, and resists drought well; succeeds best on a calcareous subsoil. Wood pale-reddish. The saccharine pods, Algaroba or St. John's Bread, of value for domestic animals; in some parts of South-Europe even used for human food. The frequent unisexuality of the flowers accounts to some extent for the want of productiveness in fruit of this plant, where but few plants exist and no bees are kept, or this sterility may be traceable to insufficiency of lime or other substance in the soil. Mr. J. S. Edgar noticed the plant to be remarkably fruitful also at the verge of the tropics in East-Australia; Mr. D. E. Martin records the same success from the Wimmera, while in very arid regions of Riverina the fruit is abundantly produced even in seasons of drought. Passed through years of severe drought in Central Australia [Rev. H. Kempe]. The seeds germinate readily. The exportation of the pods for cattle-food from Creta is very large. The fruit is used for a medicinal syrup, an imitation of chocolate and a liqueur [Wittmack]. In some of the Mediterranean countries horses and stable-cattle are almost exclusively fed upon the pods. The meat of sheep and pigs is greatly improved in flavor by this food, while its fattening properties are twice those of oil-cake. The pods contain about 66 per cent. of sugar and gum. To horses and cattle 6 lbs. a day are given of the crushed pods, raw or boiled, with or without chaff. The Spanish conquerors took this plant early to Central and South-America. The seeds should by geographic explorers be carried through the central regions of Australia, and be sown on humid spots, particularly in the limestone formation. Instances are on record of a tree having yielded nearly half a ton of pods in a season [Chambers].

Ceratopetalum apetalum, Don.

Extra-tropic Eastern Australia. A beautiful tree with long cylindrical stem, Height reaching 90 feet, diameter 3 feet. Wood soft, light, tough, closely-grained, fragrant, good for joiners' and cabinet-makers' work, locally in request for coachbuilding and therefore called coach-wood by the colonists.

Cercocarpus ledifolius, Nuttall.

California. Becomes in favorable spots a tree 40 feet in height, with a stem-diameter of $2\frac{1}{2}$ feet. The wood is the hardest known in California. It is of dark color, very dense, used for bearings in machinery [Dr. Gibbons]. C. parvifolius is of lesser dimensions.

Cereus Engelmanni, Parry.

Utah. A dwarf species, with large scarlet flowers and fruits of strawberry-flavor and refreshing taste. C. Lecomtei attains there the size of a flour-barrel.

Cereus giganteus, Engelmann.

New Mexico and Arizona. It attains the stupendous height of 60 feet, with a proportionate columnar thickness. It yields edible fruit. Lives unprotected at Port Phillip, withstanding the sea-air close to the shores, and growing at the rate of nearly a foot a year. It was introduced by the writer many years ago. Columnar species of Cereus, rising to a height of 40 feet, occur also in Argentina. C. repandus and C. triangularis (Haworth), of the West-Indies and Mexico, together with several other species, are available as hedge-plants in places free from frost. C. Atakamensis (Philippi) is a rather large species, widely scattered over the high plateau of Chili and Bolivia up to the cold region of 13,000 feet. Née speaks of a Mexican Cactus (probably an Echinocactus) 5 feet in diameter by 3 feet in height.

Cereus Pringlei, Sargent.

Sonora. Next to C. giganteus, the biggest Cactus. The autochthones bake the pulp of the fruit into cakes [E. Palmer, N. v. Nagi].

Cereus Quixo, Gay.

Chili. This stately Cactus attains a height of 15 feet, and is one of the hardiest species. The charming snow-white flowers are followed by sweetish mucilaginous fruits, available for the table [Philippi].

Cereus Thurberi, Engelmann.

North-Western Mexico and Arizona in arid regions. Attains a height of 20 feet; the fruits vary in size from that of a hen's egg to that of an orange; they are of delicious flavor, pleasant taste and very nutritious.

Cerinthe major, Linné.

Countries around the Mediterranean Sea. A handsome but annual herb, particularly alluded to by G. Don as a honey-plant of superior value. A few congeners exist in the same regions, among which C. minor (Bauhin) is biennial or pauciennial, and C. alpina (Kitaibel) perennial.

Ceroxylon andicola, Humboldt.*

The Wax-palm of New Granada, ascending the Andes to 11,000 feet. One of the most majestic and at the same time one of the most hardy of all Palms, attaining occasionally a height of 180 feet. The trunk exudes a kind of resinous wax, about 25 lbs. being obtainable at a time from each stem; this, after the admixture of tallow, is used for candles. There are several other andine Palms, which could be reared in Australian forests or in sheltered positions about our dwellings.

Ceroxylon australe, Martius. (*Juania australis,* Drude.)

Juan Fernandez, latitude 34° South, on the higher mountains.

Ceroxylon Klopstockia, Martius.

Venezuela. This very tall Wax-palm reaches elevations of 6,000 feet.

Cervantesia tomentosa, Ruiz and Pavon.

Forest-mountains of Peru. This tree yields edible seeds. It is likely to prove hardy in lower forest-regions of the warmer extra-tropic countries.

Cestrum nocturnum, Linné.

West-Indies, Southern Mexico. Praised above almost all other plants for its fragrance in Mexico, its flowers lasting through the summer and autumn, and their scent being particularly powerful at night [Dr. Barroeta]. In South-Africa preferentially used for wind-breaks, cuttings striking root with the utmost ease [Prof. McOwan]. Foliage poisonous.

Cetraria Islandica, Acharius.

Colder regions of Europe, Asia and North-America. This renowned lichen, inappropriately called "Iceland-Moss," deserves translocation to other cold parts of the globe; it yields, on boiling, a nutritious jelly, pleasant after removal of the bitter principle [Cetrarin], the latter rendering this lichen additionally valuable in medicine.

Chærophyllum bulbosum, Linné.

Middle Europe and Western Asia. The Parsnip-Chervil. A biennial herb. The root a very palatable culinary esculent, considerably richer in starch than potatoes. To be kept some time before consumed [Vilmorin].

Chærophyllum macrospermum, Willdenow.

Turkey and Persia, in the cool regions, ascending to alpine elevations. A biennial herb, the sweetish root of which serves as a culinary vegetable.

Chamædora elatior, Martius.

Mexico, at an elevation of 4-5,000 feet. This graceful palm attains only a height of about 12 feet and bears some frost. With many of its congeners available for table-decoration. The oldest generic name is Morenia.

Chamærops excelsa, Thunberg.* (*Trachycarpus excelsus,* Wendland.)

Southern China, as far north as Napong, also in Japan. This Fan-palm is highly desirable, although not so tall as the name

would indicate. The hardiest of all palms; has stood 3° F. with only a slight litter [Count de Saporta]. Hardy in the mild middle coast-regions of England. Cordage prepared from the leaves does not decay in water [Dupont]. Rate of growth while young at Melbourne about 1 foot a year. The hairy covering of the stem of this palm and of Livistona Chinensis is utilised for fixing lime-plaster to buildings in Japan [Christie]. C. Fortunei (Hooker), the Chusan-palm from North-China, is a variety or closely allied species. It attains a height of about 30 feet, and endures considerable frost. The leaves can be employed for plaiting palm-hats, the fibrous leaf-sheaths for making brushes, brooms and cordage. Other hardy palms might be naturalised and used for various purposes here, irrespective of their ornamental features.

Chamærops humilis, Linné.

The Dwarf Fan-Palm of South-Europe, North Africa and the most south-western parts of Asia. Growth satisfactory up to 44° N. Height to 20 feet. It is very ornamental for gardens and plantations, and particularly eligible for scenic effect. Hats, mats, baskets, fans and brushes are made from the leaves.

Chamærops Khasyana, Griffith. (*Trachycarpus Khasyanus,* H. Wendland.)

In the Himalayas, at elevations of from 4,000 to 8,000 feet, also according to Kurz in dry pine-forests of Martaban and Ava.

Chamærops Martiana, Wallich. (*Trachycarpus Martianus,* H. Wendland).

Ascends the mountains of Nepal to 8,000 feet. This Fan-palm attains a height of 50 feet, and is altogether a noble object. Reaches higher altitudes in the Himalayas than any other species, indeed where snow occurs or covers the soil four or five months during the year.

Chamærops Ritchieana, Griffith. (*Nannorhops Ritchieana,* H. Wendland.)

Arid mountains of Afghanistan to 34° N. Seemingly the only native palm there. Extensively used for cordage; leaves also made into baskets and mats; fruit locally used like dates [Atkinson]. Has proved hardy even in England. Even young plants did not suffer at a temperature of 17° F. in Florence [Dr. Beccari].

Chelidonium majus, Fuchs.

The Celandine. Europe and Western Asia, wild to latitude 63° N. in Norway. A perennial herb of medicinal value. Chemical principles: chelerythrin and chelidonin; also a yellow pigment, chelidoxanthin.

Chelone glabra, Linné.

North-America. The "Balmony." A perennial herb, which has come into therapeutic use.

Chenopodium ambrosioides, Linné.

Tropical and sub-tropical America. "Mexican Tea" and "Worm-seed." An annual medicinal herb. Chenopodium anthelminticum seems to be a perennial variety of this species. Easily naturalised.

Chenopodium auricomum, Lindley.

Australia, from the Darling-River to Carpentaria and Arnhem's Land. A tall perennial herb, furnishing a nutritious and palatable spinage. Dr. Leichhardt alludes to it as an Atriplex. It will live in arid desert-regions. It is one of the "Blue Bushes" of the squatters, who value it as a nutritive and wholesome pastoral plant. Several other species of Chenopodium, among them the European C. bonus Henricus (Linné) and C. Californicum (S. Watson) afford fair spinage, but they are annual.

Chenopodium Blitum, F. v. Mueller. (*Blitum virgatum*, Linné.)

From South-Europe to Middle Asia. An annual herb, in use there as a cultivated spinage-plant. The fruits furnish a red dye. The genus Blitum was reduced to Chenopodium by the writer in Caruel's *Nuovo Giornale Botanico* many years ago, and in 1864 by Dr. Ascherson, who gave to B. virgatum the name Chenopodium foliosum C. capitatum, (*Blitu " capitatum*, Linné) may not be really a distinct species. Nyman regards its nativity unascertained. Some of this group of plants are useful to anglers, attracting fish, when thrown into rivers or lakes.

Chenopodium nitrariaceum, F. v. Mueller.

Interior of Australia, especially in localities occasionally humid, reaching in some places the south-coast. A somewhat woody, tall "Salt-bush," liked particularly by sheep. Extolled also by Mr. Fred. Turner as cropped down so closely, to allow of recuperation only with difficulty. The plant might be transferred to the genus Rhagodia.

Chenopodium Quinoa, Willdenow.

New Granada, Peru, Chili. An annual herb. Admitted here as a savory and wholesome spinage-plant, which can be grown so quickly, as to become available during the short summers of even the highest habitable alpine latitudes. In Peru the seeds are used for a nutritious porridge [Tschudi, Markham].

Chionachne cyathopoda, F. v. Mueller.

Tropical and Eastern sub-tropical Australia. With C. barbata (R. Brown), and C. Wightii (Munro) of India and Queensland, a valuable fodder-grass, yielding a large return. Sclerachne punctata (R. Brown) from Java is closely allied.

Chloris scariosa, F. v. Mueller.

Tropical Australia. Particularly recommended by Mr. Walter Hill as a pasture-grass. Dr. Curl mentions this and C. divaricata (R. Brown), from North and East Australia, as useful summer- and autumn-grasses, even in the cooler clime of New Zealand.

Chloris truncata, R. Rrown.

The Windmill-grass. South-Eastern Australia, as far south as Port Phillip. This perennial and showy grass is regarded by Mr. Walter Bissill as an excellent summer-and-autumn-grass of ready growth, relished by grazing animals; matures seeds freely. C. ventricosa (R. Br.) is another valuable East-Australian species. Several other congeners from the eastern or western world deserve the attention of graziers, as furnishing good provender. Chemical analysis will determine their nutritive value, though the degree of liking of such grasses by pasture-animals can only be found out by rural tests.

Chlorogalum pomeridianum, Kunth.

California, frequent on mountains. This lily-like plant attains a height of 8 feet. The heavy bulb is covered with many coatings, consisting of fibres, which are used for cushions and mattresses; contracts are entered into for the supply of this material on a rather extensive scale [Professor Bolander]. The inner part of the bulb serves as a substitute for soap, and the possibility of utilising it for technological purposes, like the root of Saponaria, might be tested as it contains saponin.

Chloroxylon Swietenia, De Candolle.

The Satin-wood. Mountains of India. Like the allied Flindersias, possibly this tree would prove hardy in sheltered places of milder extra-tropic latitudes, the cognate Cedrela australis advancing in East-Australia southward to the 36th degree. A resin, valuable for varnishes, exudes from the stem and branches.

Chondrus crispus, Lyngbye.

Shores of the Northern Atlantic Ocean. "Caragaheen." This well-known alg yields a nutritious and palatable gelatine on boiling, and has thus become even of some therapeutic importance. The ready steam-communication all over the world affords doubtless now the opportunity of carrying also highly useful algs widely from shore to shore in portable aquaria. In Australia the Eucheuma

speciosum, Gracilaria lichenoides (J. Agardh) and Gelidium glandulifolium (Harvey) are marine jelly-weeds, well deserving of wide translocation.

Chrysanthemum cinerarifolium, Boccone. (*Pyrethrum cinerarifolium,* Trevisan).

Austria. Furnishes the Dalmatian insecticidal powder. It is superior even to the Persian powder as an insecticide; it will keep for years. It is prepared from half-opened flowers, gathered during dry weather and exsiccated under cover. Best applied in puffs from a tube. To be used also against aphides [W. Saunders. See further U.S. Agricultural Report for 1881-2.] Serves to keep fresh meat for days from decay.

Chrysanthemum Parthenium, Persoon. (*Pyrethrum Parthenium,* Smith.)

Middle and Southern Europe. "Feverfew." The root, foliage and flowers of this perennial herb are in request for medicinal purposes since ancient times; the variety with yellow foliage serves for edging of garden-plots, ribbon- and carpet-culture.

Chrysanthemum roseum, Adam. (*Pyrethrum roseum,* Bieberstein).

Sub-alpine South-Western Asia. This perennial herb, with C. coronopifolium (Willdenow) yields the Persian Insect-powder. Effective against aphides. Centipeda (Myriogyne) could doubtless also be converted into a strong insecticidal powder.

Chrysopsis graminifolia, Nuttall.

Southern States of North-America. This herb furnishes a fibre of soft texture and silk-like lustre [K. Mohr].

Chusquea Culeou, E. Desvaux.

Chili, Valdivia, Argentina. This bamboo does not often exceed 20 feet in height; the autochthones on the La Plata-River use it for lances. C. heterophylla and C. Cumingii (Nees) serve in the same region for thatch-roofing [Hieronymus]. C. andina (Philippi) grows in Chili near the snow-line.

Cicer arietinum, Dodoens.*

South-Europe and South-Western Asia. The Gram or Chick-Pea, introduced into China during the 14th century [Bretschneider]. An annual herb, valuable as a pulse for stable-food, but an extensive article also of human diet in India. Colonel Sykes counted as many as 170 seeds on one plant. In Spain, next to wheat, the most extensively used plant for human food [Honorable Caleb Cushing]. The plant suppresses weeds, and is of special service in the rotation of crops. The return is in about four months. The seeds can be converted into pea-meal, or can be used in various other ways for culinary purposes.

Cichorium Endivia, Linné.

South-Europe, North-Africa, Orient, Middle Asia. A biennial plant, used already in ancient times as a culinary vegetable. In Norway it grows to lat. 70° (Schuebeler.) Boissier regards it as culturally arisen from the annual C. divaricatum [Schousbye] of the shores of the Mediterranean Sea. The inner leaves are bleached for an early vegetable in the season by tying the outer leaves together [Vilmorin.] Matures seeds, fit to germinate, even in the hottest desert-regions of Central Australia.

Cichorium Intybus, Linné.

Chicory. A well-known perennial plant, indigenous to Europe, Northern-Africa and South-Western Asia, extending to North-Western India, where it ascends to 11,000 feet [Dr. Aitchison]. The roots much used as a substitute for coffee; 5,000 tons of Chicory valued at £68,000 were imported into the United Kingdom in 1884. This plant requires a rich deep loamy soil, but fresh manure is detrimental to the value of the root. It is also a good fodder-plant, especially for sheep, and can be kept growing for several years, if cut always before flowering. The root can be dressed and boiled for culinary purposes; the leaves are useful for salad, particularly when the plants are removed to dark warm places for bleaching [Kuehnel]; seeds will keep for several years [Vilmorin]; medicinal use can be made also of the fresh root. Indigenous in Norway to lat. 63° 30′ [Schuebeler].

Cimicifuga racemosa, Elliott.

The "Black Snake-Root" and also "Cohosh" of North-America. A perennial herb of medicinal value, the root possessing emetic properties.

Cinchona Calisaya, Ruiz and Pavon.*

Andes of Peru, New Granada, Brazil and Bolivia, 5,000 to 6,000 feet above the ocean. This tree attains a height of 40 feet; it yields the Yellow bark and also part of the Crown-bark. It is the richest yielder of quinin, and also produces cinchonidin, but little of other alkaloids. The most valuable species in Bengal, braving occasional night-frost. This has flowered at Berwick (Victoria) already ten years ago under the care of Mr. G. W. Robinson, from plants supplied by the author, therefore as far south as Port Phillip; there also good seeds matured. It grows under conditions more limited than those of C. succirubra, nor is it so easily propagated. All of its varieties do not furnish bark of equal value. The Santa Fé variety ascends the Andes of New Granada 10,000 feet, and produces the highly valuable soft Columbia-bark. The variety Ledgeriana comes from Brazil, south-east of Lake Titicaca. Its bark yielded in Java 11 to 12 per cent. of quinin. An analysis by Mr. W. E. Matthews, made of bark from C. calisaya trees, grown at Berwick, near Port Phillip, gave about 6½ per cent. alkaloids, 2.67 being quinine.

The renewed bark, obtained by covering the stem, where the bark has been removed, with moss or matting, according to Mr. McIvor's method, realised double the ordinary market-price, and in C. succirubra even more [Woodhouse]. Young Cinchona-plants are subject to the attacks of Helopeltis Antonii, which insect preys also on the Tea-bush in India.

Cinchona cordifolia, Mutis.*

Peru and New Granada, on the Andes at between 6,000 and 8,000 feet elevation, and according to Mr. Willis Weaver at Bogota (probably under the shelter of forests) up to the frosty region of 9,500 feet. Provides the hard Cartagena-bark or West Pitaya-bark, one extremely rich in alkaloids. It is a species of robust constitution, grows with rapidity and vigor. The thickest bark is obtained in the highest altitudes, which are often involved in misty humidity by passing clouds [Cross].

Cinchona micrantha, Ruiz and Pavon.

Cordilleras of Bolivia and Peru. This tree attains a height of 60 feet, and from it part of the Grey and Huanuco-bark as well as Lima-bark are obtained. It is comparatively rich in cinchonin and quinidin, contains however also quinin.

Cinchona nitida, Ruiz and Pavon.

Andes of Peru and Ecuador. This tree rises to 80 feet under favorable circumstances. It also yields Grey bark and Huanuco-bark, besides Loxa-bark. It will probably prove one of the hardiest species. It contains predominantly cinchonin and quinidin.

Cinchona officinalis, Linné (partly).* (*Cinchona Condaminea,* Humboldt.)

Andes of New Granada, Ecuador and Peru, at a height of 6,000 to 10,000 feet. Yields Crown or Brown Peru-bark, besides part of the Loxa-bark. Comparatively rich in quinin and cinchonidin. The temperature of the middle regions of the Andes, where this tree grows, is almost the same as that of the Canary-Islands. Superabundance of moisture is particularly pernicious to this species. The hardiest of all cultivated kinds. The Crispilla variety endures a temperature occasionally as low as 27° F.

Cinchona lancifolia (Mutis) is considered by Weddell a variety of C. officinalis. This grows where the mean annual temperature is that of Rome, with however less extremes of heat and cold. It yields part of the Pitaya-bark.

Cinchona Pitayensis must also be referred to C. officinalis as a variety. This attains a height of 60 feet and furnishes also a portion of the Pitaya-bark. It is this particular cinchona, which in Upper India yielded in some instances the very large

quantity of 11 per cent alkaloids, nearly 6 per cent. quinin, the rest quinidin and cinchonin; this plant is now annihilated for bark-purposes in its native forests.

Cinchonas raised from seeds provided by the writer of this work, have withstood the slight frosts at San Francisco [G. P. Rixford.]

The Uritusinga-or Loxa-variety grows in its native forests to a height of 60 feet and more [Pavon] and attained in Ceylon in fifteen years a height of 28 feet, with a stem-girth of nearly 2 feet. The price of its bark in 1879 was about 7s. per lb, and of renewed bark 11s. Mr. McIvor obtained 6,850 cuttings from one imported plant in twenty months; but all Cinchonæ produce seeds copiously, so that the raising of great numbers of plants can be affected with remarkable facility. The bark has yielded 7.4 to 10.0 per cent. sulphate of quinin [Howard].

In Java some of the best results were obtained with Cinchona Hasskarliana, Miq., a species seemingly as yet not critically identified. Cinchona-seeds do not long retain their vitality; but as they are so very light, no difficulty exists in sending them speedily even to widely distant places.

Cinchona succirubra, Pavon.*

Middle Andine regions of Peru and Ecuador. A tree, attaining a height of 40 feet, yielding the Red Peru-bark, rich in cinchonin and cinchonidin. It is this species, which is predominantly cultivated on the mountains of Bengal. In India it thrives at lower elevations than other Cinchonas, proves of quicker growth, and there the mixed cheap Cinchona-alkaloids forming the "Quinettum" are largely derived from this plant [G. King, J. S. Gamble]. It has been found hardy in Lower Gippsland and the Westernport-district of Victoria. It grew in Madeira at an elevation of 500 feet, after having been planted two and a half years, to a height of 20 feet, flowering freely also. All these Cinchonas promise to become of importance for culture in the warmest regions of extra-tropical countries, on places not readily accessible or eligible for cereal culture. The Peruvian proverb, that Cinchona-trees like to be "within sight of snow," gives some clue to the conditions under which they thrive best. They delight in the shelter of forests, where there is an equable temperature, no frost, some humidity at all times both in air and soil, where the ground is deep and largely consists of the remnants of decayed vegetable substances, and where the subsoil is open. Drippage from shelter-trees too near will be hurtful to the plants. Closed valleys and deep gorges, into which cold air will sink, are also not well adapted for Cinchona-culture. The Cinchona-region may be regarded as inter-jacent between the coffee- and the tea- region, or nearly coinciding with that of the Assam-tea. Cross found the temperature of some of the best

natural Cinchona-regions to fluctuate between 35° and 60° F. We here ought to consociate the Peru-bark plants with naturally growing fern-trees, but only in the warmest valleys and richest soil. The best temperature for Cinchonas is from 53° to 66° F.; but for the most part they will endure in open places a minimum of 32° F.; in the brush-shades of the Botanic Garden of Melbourne, where already many years ago Cinchonas were raised by the thousands, they have even resisted uninjured a temperature of a few degrees less, wherever the wind had no access, while under such very slight cover the Cinchonas withstood also a heat of a few degrees over 100° F.

The plants are most easily raised from seed, best under some cover such as mats; they produce seeds copiously some years after planting. C. succirubra, first introduced into California by the writer of this work together with the principal other species, thrives well in the lower coast-ranges as far north as San Francisco; better indeed than C. Calisaya, according to Dr. Herman Behr. The quantity of alkaloids in the bark can be much increased by artificial treatment, if the bark is only removed to about one-third on one side of the stem and the denuded part covered with moss or straw-matting (kept moist), under which in one year as much bark is formed as otherwise requires three years' growth—such forced bark moreover containing the astounding quantity of 25 per cent. alkaloids, because no loss of these precious substances takes place by gradual disintegration through age. The root-bark of some Cinchonas has proved to contain as much as 8 per cent. of alkaloids (see Gardeners' Chronicle, 1877, p. 212). The income from Java-plantations is considerably over double the cost of the expenses of culture and transit. Mr. Howard's opinion, that Cinchonas in lowland-plantations produce a far less quantity of alkaloids, needs further confirmation, particularly regarding the valuable quinin and cinchonidin; probably however geologic conditions have in all instances to be taken into account also.

Young Cinchona-plants are set out at distances of about 6 feet. The harvest of bark begins in the fourth or fifth year. The price varies in Europe from 2s. to 9s. per lb. according to quality. The limits assigned to this literary compilation do not admit of entering further into details on this occasion; but I may add, that in the Darjeeling-district over three millions of Cinchona-plants were already in cultivation during 1869 in Government-plantations. Cultivation of Cinchona for commercial purposes was first initiated in Java through Dr. Hasskarl in 1851; but 240,000 lbs. of bark were already exported from this island in 1880. The British harvest in the Madras-Presidency alone amounted to 150,000 lbs. in 1875. Brigade-Surgeon Dr. G. King reports in 1880, that four million trees of Cinchona succirubra are now under his control in the Skkim-plantations. This has proved the hardiest species; it grows under a wide range of conditions and seeds freely; thus it

is the most valuable Cinchona in the elevations of Sikkim. In the Neilgherries more than 600,000 Cinchona-plants were distributed from the Government-plantations in 1879, and 1,322 lbs. of seed [Barlow]; from 80,000 to 250,000 seedlings being obtainable from one pound of sound seed, as almost every grain will grow. All its varieties produce bark of great value. The total amount of alkaloids is at an average of 4 per cent. If the trees were cut every seven or eight years and simultaneous re-planting should take place, Dr. King could keep up an annual supply of 366,000 lbs. of bark merely from the plantations under his control. In 1883 there were as many as 128 millions of plants under cultivation in British India, of which 22 millions were two years old. The importations of Cinchona-bark into the United Kingdom in 1884 amounted to 106,000 cwt., of the value of £907,000; in 1882 the quantity was 139,000 cwt. and the cost £1,781,000. In 1886 it came to 145,367 cwt. Now much bark is locally treated in India for the extraction of the alkaloids. The total number of deaths of the Indian population from fever was considered to approach a million and a half annually before Cinchona-culture was introduced.

Cinna arundinacea, Linné.

North-America. There recorded as a good fodder-grass; perennial, somewhat sweet-scented. Particularly adapted for forest-meadows. Blyttia suaveolens (Fries) is according to Dr. Asa Gray a variety with pendent flowers.

Cinnamomum Camphora, Fr. Nees.

The Camphor-tree of China and Japan, north to Kinsin, attaining a height of about 40 feet. It endures the occasional frosts of a clime like that of Port Phillip, though the foliage will suffer. It likes light damp soil. The wood, like all other parts of the tree, is pervaded by camphor, hence resists the attacks of insects. The well-known camphor is obtained by distilling or boiling the chopped wood or root; the subsequently condensed camphoric mass is subjected to a purifying sublimation-process.

Cinnamomum Cassia, Blume.

Southern China. This tree produces the Chinese cinnamon or the so-called Cassia lignea. Hardy at Maritzburg, Natal [J. M. Wood]. Sir Joseph Hooker found on the Khasya-mountains up to 6,000 feet three cinnamons producing similar bark—namely: C. obtusifolium, C. pauciflorum and C. Tamala (Nees), the latter species extending to Queensland. Dr. Thwaites notes the true Cinnamon-tree (C. Zeilanicum, Breyn) even up to 8,000 feet in Ceylon, but the most aromatic bark comes from lower altitudes. Cinnamon-leaves yield a fragrant oil, and the root gives a sort of camphor. Mr. Ch. Ford has ascertained, that the Chinese cut Cinnamomum Cassia when six years old, the time chosen being from March to May, after which season the bark loses much of its

aroma. The plant is cut to near the root. The bark on distillation affords the Cassia-oil, 1 cwt. of bark yielding nearly 1 lb. of oil, which is much in use for confectionery and culinary purposes and the preparation of scented soaps. Oil can also be obtained from the foliage. C. Zeilanicum (Breyn), the true Cinnamon-tree of Ceylon developes perfectly in East-Australia to rather beyond the tropic, indeed as far south as Moreton-Bay.

Cinnamomum Loureiroi, Nees.

Cochin-China and nearest regions, also perhaps Japan. A middle-sized tree. The leaves locally in use as a condiment and for perfumery.

Cistus Creticus, Linné.

Countries on the Mediterranean Sea, particularly the eastern. This shrub, with C. Cyprius (Lamarck), furnishes the best ladanum-resin. Other species yield a less fragrant produce.

Citrus Aurantium, Linné.*

The Orange-tree (in the widest sense of the word). A native of South-Eastern Asia. A plant of longevity; thus a tree at Versailles, known as the "Grand Bourbon," is still in existence, though planted, in 1421; and very much older still are Citrus-trees at Cordova, and yet bearing, Even under glass at Hampton-Court are trees ovor 300 years old. Stems of very good Orange-trees have gained such a size, as to require two men to clasp them. If intervening spaces exist in orangeries, they might be used for raising herbaceous honey-plants. Any specific differences, to distinguish C. Aurantium from C. Medica, if they once existed, are obliterated now through hybridisation, at least in the cultivated forms. In Central India a peculiar variety is under culture, producing two crops a year; the blossoms of February and March yield their ripe fruit in November and December, whereas from the flowers of July mature fruits are obtained in March and April. To prevent exhaustion only alternate fruiting is allowed. Nearly 5 million bushels of oranges and lemons, representing a value of £1,782,000, were imported into the United Kingdom during 1884. During 1886 it was 4,388,291 bushels, valued at £1,488,341. The seeds of Oranges, with other easily germinating seeds, should during exploring expeditions through mild countries be disseminated. Quick steam-navigation renders it now possible, to provide—when carefully packed—for the European and North-American market fresh Oranges and many other kinds of orchard-fruits from Australia, South-America and South-Africa during the improvided season of the northern hemisphere. At Port Jackson a tree of the Mandarin-orange bore 4,000 fruits in a season [Haldane]. It is not unusual for orange-trees to continue in full bearing for 60 or 70 years, and after that the wood is still valued for its durability, fragrance and beauty. [illegible] ar-

production anywhere take place, a wine can be prepared from the juice of peeled oranges, which proved of remarkable strength. The Sorrento-honey derives its delicious perfume from orange-flowers, and it has become classical as the best and analogous to that of Hymethus [Laura Redden]. For detail-information on these kinds of plants should be consulted the important recent work of Dr. Bonavia, "The Cultivated Oranges and Lemons of India," with an illustrative atlas. Orange-trees are in the United States frequently attacked by the highly injurious Australian Icerya Purchasii. Its ravages can to some extent be checked by the Lestophanus Iceryae, a parasitic fly, also by the Vedalia cardinalis, one of the so-called lady-bird beetles, which in New Zealand keep down, perhaps with allied species, the Icerya. They have therefore been introduced from Australia into America by Mr. Koebele, an emissary of Professor Riley of the Entomologic Department of Washington, first attention having been drawn to this antagonism by Mr. Crawford of Adelaide. Mr. Charles French, the Government Entomologist of Victoria, has in his new departmental work described and illustrated these insects. Some varieties are excellent for hedges, for which they are much used in Japan. Burnt earth is valuable as an admixture to soil in orangeries. On the high authority of Dr. Piesse it may be stated, that recently rather more than $1\frac{1}{4}$ million pounds weight of orange-flowers were gathered annually for perfumery-purposes merely at Nice and Cannes. As prominent varieties of C. Aurantium the following may be distinguished:—

Citrus Bergamium, Risso. From the fruit-rind of this variety Bergamotte-oil is obtained; the flowers also yield oil. The Mellarosa-variety furnishes a superior oil and exquisite confitures.

Citrus Bigaradia, Duhamel. The Bitter Orange. This furnishes from its flowers the Neroli-oil, so delicious and costly as a perfume. It is stated, that orange-flowers to the value of £50 might be gathered from the plants of an acre within a year. The rind of the fruit is used for candied orange-peel and marmalade. Bitter principle: hesperidin in the rind, limonin in the seeds. The Bigarade furnishes the most valuable of any stock for orange-grafting in South-Africa, according to Prof. McOwan.

Citrus decumana, Linné. The Shaddock or Pompelmos. The fruit will exceptionally attain a weight of 20 pounds. The pulp and thick rind can both be used for preserves.

Citrus dulcis, Volkamer. The Sweet Orange, of which many kinds occur. The St. Michael Orange has been known to bear in the Azores on sheltered places 20,000 fruits on one tree in

a year. Navel-oranges, weighing 19 ounces, have been obtained at Rockhampton; other varieties have been known to reach 3 pounds [Thozet]. Neroli-oil is also obtained from the flowers of this and closely allied varieties. The oil of orange-peel might be used as a cheap and pleasant one in the distillation of costly odorous substances, Even in Australia already an aged tree of the ordinary orange yielded over 12,000 fruits in a particularly favorable season. In tracts close to the coast the trees need shelter. About four million pounds of orange-flowers are annually treated for Neroli-oil at and in the vicinity of Grasse, the price being about fourpence a pound (*Revue agricole de Maurice*).

Citrus nobilis, Loureiro. The Mandarin-Orange. The thin peel separates most readily from the deliciously flavored sweet pulp. There are large and small fruited Mandarin-oranges; the Tangerine variety is one of them; also a dwarf variety with seedless fruits exists (A. Jupp).

Citrus Australasica, F. v. Mueller.

Coast-forests of extra-tropical Eastern Australia. A shrubby species, with ellipsoid or almost cylindrical fruits of lemon-like taste, measuring 2 to 4 inches in length. They are thus very much larger than those of Atalantia glauca of the eastern desert-interior of tropic Australia, but both are of similar taste. These plants are entered on this list, together with C. Planchoni, merely to draw attention to them as probably capable of improvement in their fruit through culture.

Citrus Japonica, Thunberg.

The Kumquat of Japan. A shrubby Citrus with fruits of the size of a gooseberry, from which on account of their sweet peel and acid pulp an excellent preserve can be prepared.

Citrus Medica, Linné.*

The Citron-tree (in the widest sense of the word). Indigenous to Southern Asia. For the sake of convenience it is placed here as distinct from C. Aurantium. As prominent varieties of the Citrus Medica may be distinguished:—

Citrus Cedra. Gallesio. The true Citron. From the acid verrucular fruit essential oil and citric acid can be obtained, irrespective of the ordinary culinary use of the fruit. A large variety with thick rind furnishes candied the citrionade or succade. The Cedra-oil comes from a particular variety.

Citrus Limonium, Risso. The true Lemon. Lemon-juice is largely pressed from the fruit of this variety, while the thin smooth aromatic peel serves for the production of volatile oil

or for condimnts. The best oil is obtained by the so-called Ecuelle process (puncturing the rind); distilled oil is of inferior quality [Watt]. The quantity of essential oil of lemon exported from Messina alone during 1887 amounted to about 440,000 lbs., valued at £125,000; while about 500,000 gallons of lemon-juice were exported during the same period. The juice of this fruit is particularly rich in citric acid. A large variety is the Rosaline-Lemon. A Giant-Lemon has quite recently been introduced into Victoria from some mountains in Fiji by Messrs. Chaffey, through Mr. R. Sawers. It shows immunity against fungus-blights; its fruit may occasionally attain a weight of $4\frac{1}{2}$ lbs. and a girth of $22\frac{1}{2}$ inches; it has a thick peel and delicious flavor (Mildura-Cultivator, 4th October, 1890).

Citrus Limetta, Risso. The true Lime. The best lime-juice is obtained from this variety, of which the Perette constitutes a form. Less hardy than most other varieties. The Lime is one of the best and most enduring hedge-plants for warmer countries [H. A. Wickham].

Citrus Lumia, Risso. The Sweet Lemon, including the Pear-Lemon, with large pear-shaped fruit. Rind thick and pale; pulp not acid. This variety serves for particular condiments.

A Tipperah-variety, known as "Sour Pomelloe," produces richly, the fruits abounding in exceedingly acid juice [Bartlett]. West Indian limes are particularly well produced in sub-tropic Eastern Australia [J. S. Edgar].

Coal-oil proved the most effectual remedy in Florida to dislodge scale from any parts of citrus-plants; half a pint of oil is to be mixed with sifted wood ashes and then with 6 gallons of water, this fluid to be syringed over the trees. Mr. Silberbauer recommends a mixture of 1 lb. genuine whaleoil-soap in 5 gallons of water for periodic syringing to subdue the Icerya Capnodium citri is the ordinary Black-smut of Citrus-trees.

Citrus Planchoni, F. v. Mueller. (*C. Australis,* Planchon, partly).

Forests near the coasts of sub-tropic Eastern Australia. A noble tree, fully 40 feet high, or according to C. Hartmann even 60 feet high, with globular fruit about the size of walnuts, called in Australia Native Oranges. The species first appeared under the above name in the "Report on the Vegetable Products of the Intercolonial Exhibition of 1867." Its beautiful wood takes a high polish; hence it is made use of for the finest cabinet-work. Through regular culture doubtless the fruit could be enlarged and improved.

Cladrastis tinctoria, Rafinesque.

Eastern States of North-America. Yellow-wood. The wood of this tree produces a saffron-yellow dye.

Clausena Wampi, Blanco. (*Cookia punctata.* Sonnerat.)

South-Eastern Asia. A small very odorous tree. Fruit about the size of a gooseberry, of balsamic fragrance, thus rather a condiment than a table-esculent. The southern cultural limit is not yet in reference to this plant ascertained; but Mr. Fr. Turner notes, that it fruits freely at Port Jackson. Likes a humid clime.

Clavaria botrytis, Persoon.

Europe. This and the following are species, admitted for sale among Silesian mushrooms, according to Dr. Goeppert: C. brevipes (Krombholz), C. flava, C. formosa, C. grisea (Persoon), C. muscoides (L.) C. aurea (Schæffer), C. palmata (Scop.), C. crispa (Wulfen). Morren mentions as much consumed in Belgium C. fastigiata (L.). Bergner and Trog illustrate C. botrytis (Persoon). Several of these extend naturally to Australia, where also various other species exist. The puff-balls, comprising species of Bovista, Lycoperdon and Scleroderma, are not specifically admitted as recommendable culinary fungs into this work, as they are only convertible into food when very young, and many become soon noxious. All Clavarias seem adapted for human sustenance; their growth should therefore be encouraged.

Claytonia perfoliata, Donn.

From Mexico to California and Cuba. An annual succulent herb, serving for salad and also spinage. The genus could be reduced to Montia.

Claytonia tuberosa, F. v. Mueller. (*Calandrinia tuberosa,* Benthæm.)

Mexico, up to cold elevations. The root of this herb is edible, and could probably be improved as an esculent by careful culture of the plants.

Clinostigma Mooreanum, F. v. Mueller. (*Kentia Mooreana,* F. v. M.)

Dwarf-Palm of Lord Howe's Island, where it occurs only on the summits of the mountains, at about 3,000 feet elevation. Likely to prove one of the hardiest of all palms.

Coccinia Indica, Wight and Arnott. (*Cephalandra Indica,* Naudin).

Southern Asia, extending to China and Silhet. Perennial, thick-rooted. The fruit is one of the commonest vegetables eaten by the natives of India [Dr. G. Watt].

Coccoloba uvifera, Jacquin.

Central America, northward to Florida. A tree, attaining a large size, fit for sandy sea-shores. Sir J. Lefroy noticed in Bermuda stems 6 feet in girth. The dark blue sweet or acidulous berries are edible, and attain a length of nearly an inch. A kind of kino is obtained from the bark; the wood yields a red dye. Dr.

Rosenthal notes as likewise producing edible fruits: C. nivea (Jacq.), C. pubescens (L.), C. excoriata (L.), C. flavescens (Jacq.), C. diversifolia (Jacq.), C. Leoganensis (Jacq.) is also a coast-tree; other species belong to forest-regions of mountains. They are all natives of the warmer zones of America.

Cochlearia Armoracia, Linné. (*Nasturtium Armoracia,* Fries.)

The Horse-radish. Middle Europe and Western Asia. Perennial. In Norway grown to latitude 70° 22′ N. Requires rich soil; best propagated from truncheons. On some soils not easily eradicated. Within the tropics this plant thrives best in shady localities. The volatile oil of the root allied to that of mustard.

Cochlearia officinalis, Linné.

The Scurvy-cress. Shores of Middle and Northern Europe, Northern Asia and North-America, also on saline places inland even on the Pyrenees. A biennial herb, like the allied C. Angelica and C. Danica (Linné), valuable as an antiscorbutic, hence deserving naturalisation. It contains a peculiar volative oil.

Cocos australis, Martius.

From Brazil to Uruguay and the La Plata-States. One of the hardiest of all palms, hardier than even the Date-palm, withstanding unprotected a cold, at which oranges and almonds are injured or destroyed. It remained perfectly uninjured at Antibes at a temperature of 15° F [Naudin]. C. pityrophylla ascends the Andes to 7,800 feet (Count de Denterghem).

Cocos flexuosa, Martius.

Brazil, extending far south. This slender and rather tall decorative Palm belongs to the dry Cactus-region with C. coronata, C. capitata, Astrocaryum campestre, Diplothemium campestre and Acrocomia sclerocarpa (Martius). It becomes a stately plant in a few years, and produces seeds most freely. Cocos coronata withstood at Hyères a temperature of 22° F. [Bonnet].

Cocos plumosa, Loddiges.

South-Brazil. This splendid Feather-palm attains a height of 60 feet. It is one of the hardiest of all palms, requiring no protection at Port Phillip. Quick of growth and particularly handsome in stature. Stem comparatively slender.

Cocos regia, Liebmann.

Mexico, up to 2,500 feet. A Palm of enormous height; almost sure to prove hardy in the mildest extra-tropic latitudes.

Cocos Romanzoffiana, Chamisso.

Extra-tropic Brazil. This noble palm attains a height of 40 feet.

Cocos Yatay, Martius.

Rio Grande do Sul, Uruguay and Argentina. Forms distinct forests mainly with C. australis and C. Datil (Drude). The last mentioned bears date-like fruits, according to Dr. Lorentz. The kernels of the nuts of C. Yatay are edible. The leaves, like those of many other palms, serve for the manufacture of hats. The incomparably valuable strictly tropical Cocoanut-palm, Cocos nucifera (Linné), has fruited at the verge of the tropic in Queensland at Rockhampton under the care of Mr. J. S. Edgar.

Coffea Arabica, Linné.*

The Coffee-plant. Mountains of South-Western Abyssinia, extending as indigenous according to Welwitsch and Peters to Mozambique and Guinea. A shrub or small tree. The cultivation within extra-tropical boundaries can only be tried with any prospect of success in the warmest and at the same time moistest regions, frost being detrimental to the Coffee-plant; it fruits however still occasionally, though scantily, at Port Jackson, but gives good results already in the northern part of New South Wales, the Mocha-variety being best adapted for the more temperate regions [Turner.] In Ceylon the coffee-regions are between 1,000 and 5,000 feet above the ocean; but Dr. Thwaites observes, that the plant succeeds best at an elevation of from 3,000 to 4,500 feet, in places where there is a rainfall of about 100 inches a year. The temperature there hardly ever rises above 80° F., and almost never sinks below 45° F. Coffee requires moist weather whilst it ripens its fruit, and a season of drier weather to form its wood. Average-yield in Ceylon 4 to 5 cwt. per acre. An extraordinarily prolific variety of Coffee was introduced thirty years age by the writer of this work into Fiji, where it now forms the main-plantations. The Coffee-plant has been found hardy as far north as Florida. For many particulars see the papers of the Planters' Association of Kandy. Chemical principles of Coffee: caffein, a peculiar tannic acid and quinic acid. The importations of Coffee into the United Kingdom in 1884 amounted to 1,134,000 cwt. (almost one-quarter being for home consumption), valued at $3\frac{3}{4}$ million pounds sterling. The import of Coffee into Great Britain during 1886 was 1,006,165 cwt., valued at £3,295,028, about a quarter of which came from British India. The loss sustained in 1878 alone by the ravages of parasitic fungus-growth on Coffee-plants in Ceylon amounted to £2,000,000, the total loss since 1869 from this source reaching £15,000,000 [Abbay]. The destruction of this Coffee-leaf fungus (Hemileia vastatrix) is to some extent effected by applying flowers of sulphur, particularly in dewy weather, and by dressing the ground with quicklime [Morris]. Still more powerfully acts a weak solution of sulphate of copper mixed with lime. The unpruned plants are less subject to the Hemileia. Mr. J. Storck, of Rewa, Fiji, found the vapours from a 5-10 per cent. aqueous solution of carbolic acid to be an effectual remedy against the

Hemileia, the evaporation being effected from sheltered vessels placed somewhat above the ground. Another fungus-disease is the leaf-rot or Candelillo, caused by Pellicularia Koleroga, (Cooke.) The Coffee-plant is also liable to suffer from the attacks of several insects, viz: Xylotrechus quadrupes, called the borer, the bugs Lecanium coffeæ, L. nigrum, Pseudococcus adonium and the larvae of the moth Agrotis segetum [Dr. G. Watt]. See also. essay by Mr. T. Dyer in Journal of Microsc. Soc., new series, vol. xx. The Coffee-plant succeeds well even in the low regions of New Britain [R. Parkinson]. Southward Eastern sub-tropical Australia is still adapted for the culture of this important plant. A new prolific variety has come into use in Brazil, the "Maragogyne" [Christy]. In America Coffee-plantations have suffered not only from the attacks of an erysiphoid fungus, but also the Cemiostoma-fly. Coffee-leaves have recently come into use as a substitute for tea.

Coffea Liberica, Bull.

Guinea. The Liberian Coffee-plant, distinguished already by Afzelius. According to Dr. Imray this species has shown immunity from the Cemiostoma-fly, and it is less effected by the Hemileia-mould. It grows to the size of a real tree, is a rich bearer, and the berries are larger than those of the ordinary Coffee-bush but the (useless) pulp is about twice as large in proportion to the seeds. The fruit requires a longer time to ripen (a year), but this species can be grown in hot tropical countries down to the coast [Lietze, Regel]. This species is highly ornamental in foliage and its flowers are deliciously scented.

Coix Lachryma, Linné.

South-Asia, New Guinea, Polynesia. "Job's Tears." This plant is cultivated for food by the eastern hill-tribes of India and supplies a staple-article of diet to the Tankhul Nagas of Manipur; it is also grown in Burma. The form cultivated for food has an easily breakable deeply furrowed shell, that of the wild plant being extremly hard and shining. Seeds require long soaking before they are sown [Dr. Watt]. The plant likes humidity; it comes to perfection at Port Phillip. C. tubulosa (Hackel) is a Papuan species.

Cola acuminata, Schott and Endlicher. (*Sterculia acuminata,* Beauvois.)

Western Africa. A small or middle-sized tree, perhaps hardy like many of the allied Sterculias, also outside the tropics in mild regions. In Jamaica it is cultivated up to an elevation of 3,000 feet [W. Fawcett]. It furnishes the famed Cola-seeds, already brought under notice by Caspar Bauhin. They have highly stimulating properties, reminding of those of Coca, and can be made into an agreeable unfermented beverage, against the pernicious custom of indiscriminately treating with alcoholic liquids. Prof. E. Heckel, of Marseille, converts the nuts as "Cola-paste" into an exceedingly concentrated nutritious product [T. Christy]. Used now also for

clearing beer (Armstrong). Medicinally recommended in cases of chronic diarrhoea and of inebriety; might be tried also in diabetes.

Colchicum autumnale, Linné.

The Meadow-Saffron. Middle and Southern Europe, Western Asia. The seeds and roots of this pretty bulbous-tuberous herb are important for medicinal use. The plant has been introduced into Australia by the writer with a view to its naturalisation on moist meadows in our ranges. Active principle: colchicin. The plant proves hardy in Norway to lat. 67° 56' [Schuebeler].

Coleus Amboinicus, Loureiro.

Southern Asia. An aromatic condiment-herb.

Collinsonia Canadensis, Linné.

Eastern North-America. A perennial herb; the root, known vernacularly as "Stone-root," is of medicinal importance, particularly as a sedative. A few other species occur in North-America.

Colocasia esculenta, Schott.* (*C. antiquorum,* Schott.)

The Taro. This celebrated plant extends from Egypt through Southern Asia to the South-Sea Islands, and is also indigenous in the warmer parts of East-Australia. The stem-like, tuberous, starchy roots lose their poisonous acridity by processes of boiling, roasting or baking. It is the Kolkas of the Arabs and Egyptians, and one of their most esteemed and abundant vegetables. Immense quantities are harvested and kept during the winter. A splendid starch is obtainable from the tubers of this and the following species. The plant proves hardy as far south as Melbourne, and is also cultivated in New Zealand. The tops of the tubers are replanted for a new crop. Taro requires a rich, moist soil, and would grow well on banks of rivers. For scenic culture it is a very decorative plant. Peronospora trichotoma (Massee) has caused vast destruction on the crops of this tuber in the Antilles.

Colocasia Indica, Kunth. (*Alocasia Indica,* Schott.)

South-Asia, South-Sea Islands and Eastern Australia. Cultivated for its stem and tubers on swamps or rivulets. This stately plant will rise in favorable localities to a height of 12 feet, the edible trunk attaining a considerable thickness, the leaves sometimes measuring 3 feet in length. In using the stem and root for food, great care is needed, to expel all acridity by some heating process. Colocasia odora and C. macrorrhiza seem varieties of this species. Several other aroid plants deserve attention for test-culture on account of their edible roots, among them Cyrtosperma edule (Seemann) from the Fiji-Islands.

Combretum butyraceum, Caruel.

The Butter-tree of Caffraria and other parts of South-Eastern Africa. The Caffirs call the fatty substance, obtained from this tree Chiquito. It is largely used by them as an admixture to their food, and is also exported. It contains about one-quarter olein and three-quarters margarin. This butter-like fat is extracted from the fruit, and is of an aromatic flavor. The tree should be hardy in the warmer and milder parts of extra-tropical countries. The exact systemic position of this tree remains still obscure.

Comptonia asplenifolia, Solander.

The Sweet-Fern of North-America. This dwarf shrub is perhaps quite worthy of dissemination on sterile hills, as the foliage contains nearly 10 per cent. of tannin; an extract of the leaves has come into the tanning trade. The plant is also not without medicinal value.

Condalia microphylla, Cavanilles.

The Piquillin. Chili and Argentina. A bush, yielding sweet, edible, succulent fruit.

Conium maculatum, Linné.

The Poison-Hemlock. Europe, Northern Africa, Northern and Western Asia. A biennial herb, important for medicinal purposes. It should however not be allowed to stray from its plantations, as it is apt to be confounded with culinary species of Anthriscus, Chærophyllum and Myrrhis, and may thus cause, as a most dangerous plant, disastrous mistakes. Active principles: coniin in the fruit, also conhydrin. The wild or naturalized plant best for therapeutic use.

Conopodium denudatum, Koch.

Western Europe. The small tuberous roots of this herb, when boiled or roasted, are available for food, and known as Earth-Chestnuts. The plant is allied to Carum Bulbocastanum.

Conospermum Stœchadis, Endlicher.

West-Australia. The question has arisen, whether this shrub, with C. triplinervium (R. Brown), ought to be introduced into any desert-country. All kinds of pasture-animals browse with avidity on the long, tender and downy flower-stalks and spikes, without touching the foliage, thus not destroying the plant by close cropping.

Convallaria majalis, Linné.

Europe, Northern and Middle Asia to Japan. The "Lily of the Valley." Far famed as a lovely fragrant spring-plant, desirable for naturalisation in any temperate forest-regions; quite a trade-

plant for bouquet-sellers; reintroduced into medicine also latterly, particularly in the treatment of cardial affections and dropsy. Both root and flowers have also sternutatorian properties.

Convolvulus floridus, Linné fil.

Canary-Islands. A shrubby species, not climbing or winding. With C. scoparius it yields the Atlantic Rosewood from stem and root.

Convolvulus Scammonia, Linné.

Mediterranean regions and Asia Minor. A perennial herb. The purgative drug, Scammonia-resin, is obtained from the root, which will grow to 2 feet in length. Plants readily raised from seeds. To obtain the drug, a portion of the root is laid bare, and into incisions made some shells are inserted, to collect the juice, which is daily removed [Maw].

Copernicia cerifera, Martius.*

Brazil, extending into Bolivia and Argentina. This magnificent Fan-palm has been proved to be hardy as far south as Sydney, by Mr. Charles Moore. It resists drought in a remarkable degree, and prospers also on a somewhat saline soil. The stem furnishes starch; the sap yields sugar; the fibres of the leaf-sheets are converted into ropes, which resist decay in water; the leaves can be used for mats, hats, baskets and brooms, and many other articles are prepared from them. The inner part of the leaf-stalks serves as a substitute for cork. This palm however is mainly valued for the Carnauba-wax, with which its young leaves are coated, and which can be detached by shaking. This is harder than bees' wax, and is used in the manufacture of candles. Each tree furnishes about 4lbs. annually. In 1862 no less than 2,500,000 lbs. were imported into Great Britain, realising about £100,000.

Coprinus comatus, Fries.

Europe, Asia. Included by Dr. L. Planchon among the Champignons for French kitchens. Other species elsewhere are probably quite as good, but they all can only be used for food in a very young state. More important are the deliquiescent species of Coprinus, such as C. atramentarius, C. ovatus, C. cylindraceus (Fries), for the preparation of a black water-color and also ink, both indelible [Wilson's Rural Cyclop.]; the black fluid emitted needs the addition of some antiseptic to preserve it. Various Coprini are also common in Victoria.

Corchorus acutangulus, Lamarck.

Tropical Africa, South-Asia and North-Australia. This plant is specially mentioned by some writers as a jute-plant. A particular machine has been constructed by Mr. Le Franc, of New Orleans, for separating the jute-fibre. With it a ton of fibre is produced in

a day by four men's work. This apparatus can also be used for other fibre-plants. The seeds of the Corchorus, which drop spontaneously, will reproduce the crop.

Corchorus capsularis. Linné.*

From India to Japan; also in North-West Australia. One of the principal jute-plants, An annual, attaining a height of about twelve feet, when closely grown, with almost branchless stem. A nearly allied but lower plant, Corchorus Cunninghami (F. v. Mueller), occurs in tropical and sub-tropical Eastern Australia. Jute can be grown, where cotton and rice ripen, be it even in localities comparatively cold in the winter, if the summer's warmth is long and continuous. The fibre is separated by steeping the full-grown plant in water from five to eight days; it is largely used for rice, wool-and-cotton-bags, carpets and other similar textile fabrics and also for ropes. In 1884 Great Britain imported 5,111,000 cwt. of jute, valued at £3,600,000. In 1883 the quantity amounted even to 7,372,000 cwt., of the value of £4,520,000, and a large quantity is also sent to the United States. Jute is sown on good land, well ploughed and drained, but requires no irrigation, although it likes humidity. The crop is obtained in the course of four or five months, and is ripe when the flowers are replaced by fruit-capsules. Good paper is made from the refuse of the fibre. Jute has been found, like hemp, to protect cotton from caterpillars, when planted around fields [Hon. T. Watts]. In India jute often alternates with rice and sugar-cane; as a crop it requires damp soil. It does not require drained land, according to Mr. C. B. Clarke. Unlike cotton, it will bear a slight frost. Under favorable circumstances 2,000 to 7,000 lbs. may be obtained from an acre, according to quality of soil. It is best grown on temporarily flooded ground, as otherwise it proves an exhaustive crop. Two hundred million pounds of jute were woven in 1876 in Dundee, and fifty million gunny-bags were exported from Britain in one single year, according to S. Waterhouse.

Corchorus olitorius, Linné.*

South-Asia and North-Australia. Furnishes, with the foregoing species, the principal supply of jute-fibre. As it also is an annual, it can be brought to perfection in the summers of the warm temperate zone. The foliage can be used for spinage. The fibre is not so strong as hemp, but very easily prepared, It will not endure long exposure to water. The seeds will keep for several years. The allied Corchorus trilocularis (Linné), of Indian origin, is likewise wild in eastern tropical and sub-tropical Australia; its fibre may be used for ropes.

Cordyline Banksii, J. Hooker.

New Zealand. This lax- and long-leaved Palm-Lily attains a height of 10 feet; its stem is usually undivided. This and the

following species have been admitted into this list for a double reason, not only because they are by far the hardiest, quickest growing and largest of the genus, and thus most sought in horticultural trade for scenic planting, but also because their leaves furnish a fair fibre for textile purposes. The small seeds are produced in great abundance, and germinate with extreme readiness. The same may be said of the three following species; their seeds can with the greatest ease be sent to the remotest distances. These Palm-Lilies ought to be naturalised copiously in forest-ranges by mere dissemination.

Cordyline Baueri. J. Hooker. (*C. Australis*, Endlicher *non* J. Hooker.)

Norfolk-Island. The stem of this stately species attains a height of 40 feet, and becoms ramified in age. It is very intimately allied to the following.

Cordyline indivisa, Kunth.

New Zealand. The stem of this thick and rigid-leaved palm-like species rises to a height of 20 feet, and remains undivided. Leaves finally 5 inches broad; yields the toi-fibre. Aged leaves persistent in a perfectly downward position for many years. Panicle at first erect. Berries white. Grows without protection in Arran [Capt. Brown].

Cordyline superbiens, C. Koch. (*C. Australis*, J. Hooker *non* Endlicher.)

New Zealand. The stem of this noble thin-leaved plant attains a height of 40 feet, and is branched. Aged leaves readily seceding; berries blue. Hardy at Torquay [W. Wood,] Power's Court, Limerick and in others of the milder localities of South-England and Ireland, also in the Island of Arran, where it grows luxuriously and flowers [Rev. D. Landsborough]. Matured seeds at Campbelltown, Argyllshire, in the open air also in Yorkshire. As these tall Cordylines ripen seeds so copiously, the latter might easily be strewn out for naturalising the plants in open places of sylvan valleys for scenic final effect. It will stand a minimum temperature of 20° F. [Gorlie]. When cut down will spring again from the root. They bend before the blast, but will not break, and are surely anchored in the soil by perpendicularly descending rootstocks [Th. Wough]. C. Sturmii (Th. Kirk) is an allied plant.

Cordyline terminalis, Kunth.

South-Asia. Polynesia, East-Australia. The roots are edible, when roasted. The leaves, like those of other species, can be utilized for textile fibre. The splendid decorative Cordylines with red or variegated foliage belong to this species.

Coriandrum sativum, Linné.

Orient and Middle Asia. An annual or biennial herb, its fruits much in use for condiments. The essential oil peculiar. Ripens seeds in Norway to lat 68° 40′ [Schuebeler]. The seeds will keep for several years; 20 lbs. are sufficient for one acre, returning 10-14 cwt. [G. Don].

Cornus florida, Linné.

The Dog-wood of Eastern North-America. A showy tree, sometimes 30 feet high. The wood in great demand for shuttles, handles, harrow-teeth, horse-collars and sledge-runners. The root-bark is of therapeutic value. The tree is hardy still at Christiania [Schuebeler].

Cornus mas, Linné.

Europe, also Asia quite to Japan. This deciduous shrub or small tree is deserving of attention, as from the fruits a very palatable preserve can be prepared [Freyn]. It answers also for hedge-growth.

Cornus Nuttalli, Audubon.

North-Western America. This is the largest of the genus, attaining a height of 80 feet, with a stem 2 feet in diameter. One of the most showy of Californian forest-trees. The wood is hard and close-grained, similar to that of Cornus florida. The natives use the small twigs for making baskets [Gibbons]. In the spring the white inflorescence is visible for miles; in autumn again the scarlet fruit-coloration becomes an ornament to the landscape [Prof. Bolander].

Cortinarius cinnamomeus, Fries.

Europe and Asia. This mushroom, together with C. violaceus (Fries), is mentioned among numerous congeners by Drs. Badham and Cooke as particularly eligible for the table. Dr. Planchon recommends also C. turbinatus (Fries).

Corylus Americana, Walter.

Eastern North-America. Not tall; easily naturalized by dissemination, but fruit small and hard-shelled [A. Gray].

Corylus Avellana, Linné.*

Europe, Northern Africa, Northern and Middle Asia. The ordinary Hazel, so well-known for its filberts or cob-nuts, one variety yielding the Barcelona-nut. A tree attaining a height of 30 feet; wood elastic, particularly valuable for gunpowder-coal, young shoots serving for hoops and walking sticks. The earliest flowering tree in northern countries. Loudon's account also of this tree is extensive and excellent. Chambers says, that generally

about £100,000 worth of hazel-nuts are annually imported into Britain. Hazel-oil is superior to almost any other for the table. An illustrated volume has (1887) been devoted by F. Goeschke to the "Hazel-nuts" in its various kinds.

Corylus Colurna, Linné.* (*C. Byzantina,* l'Ecluse).

From Hungary to Greece and the Himalayas, there at from 5,500 to 10,000 feet elevation. The Constantinople-Nuttree, the tallest of hazels, attaining 60 feet in height, of rather quick growth. Nuts much pressed for oil [Dr. K. Mueller]. Hardy at Christiania in Norway [Schuebeler]. This, as well as the Nepal-Hazel (Corylus ferox Wallich) and the Japan-Hazel (C. heterophylla, Fischer) might be naturalised in forest-gullies for their filberts.

Corylus maxima, Miller.* (*C. rubra,* Borkhausen; *C. tubulosa,* Willdenow; *C. Lambertii,* Loddiges).

Recorded as indigenous to Hungary and Istria by A. de Candolle, who however places the species nearer to C. Americana. Prof. C. Koch thinks, that it may have sprung from C. Avellana. It yields the red filbert or Lambert-nut.

Corylus Pontica, C. Koch.*

Caucasus. Taller than C. maxima. Fruit similar to the Barcelona-nut; much consumed in Constantinople [C. Koch]; called also Pontinian nut.

Corylus rostrata, Aiton.

North-America, both east and west. Never tall. Nut small, but kernel sweet. C. Mandschurica (Maximowicz), from the Amur-region, is a closely allied species or perhaps only a variety.

Corynocarpus lævigata, Forster.

The Karaka of New Zealand, also the principal forest-tree of the Chatham-Islands, attaining a height of 60 feet. The wood is light, and used by the natives for canoes. The pulp of the fruit is edible. Cattle browse on the foliage. In rich irrigated soil the tree can be adopted for very shady avenues.

Corynosicyos edulis, (*Cladosicyos edulis,* J. Hooker.)

Guinea. An annual cucumber-like plant, with edible fruits about 1 foot long and 3 inches in diameter. Referred recently by Cogniaux to the genus Cucumeropsis.

Crambe cordifolia, Steven.

From Persia and the Caucasus to Thibet and the Himalayas, up to 14,000 feet. The root and foliage of this Kale afford an esculent. Flower-stems reaching 10 feet in height; the long-stalked leaves may measure more than 2 feet in width. The root bears severe frost [Gorlie]. C. Kotschyana (Boissier) is an allied plant.

Crambe maritima, Linné.

Sea-Kale. Sandy coasts of Europe and North-Africa, in Norway to nearly 60° N. A perennial herb; the young shoots used as a wholesome and agreeable vegetable. Should be naturalised, particularly on humid tracts of country, even for pastural purposes.

Crambe Tataria, Wulfen.

From Eastern Europe to Middle Asia. Perennial. Leaves likewise used for culinary purposes. According to Simmonds the large fleshy roots also form an esculent. Can be grown still at Christiania.

Cratægus æstivalis, Torrey and Gray.

The Apple-Haw. South-Eastern States of North-America. The small juicy fruit of an agreeable acid taste.

Cratægus apiifolia, Michaux.

Eastern North-America. Highly serviceable for hedges.

Cratægus Azarolus, Linné.

Welsh Medlar. South-Eastern Europe and South-Western Asia. Hardy still in Christiania, Norway [Schuebeler]. The pleasantly acidulous fruits can be used for preserves.

Cratægus coccinea, Linné.

Eastern North-America, there called White Thorn. A valuable hedge-plant; also very handsome. Spines strong. It braves the winters of Norway as far north as lat. 67° 56′ [Schuebeler].

Cratægus cordata, Aiton.

South-Eastern States of North-America. Also much employed for hedges.

Cratægus crus Galli, Linné.

The Cockspur-Thorn. Eastern North-America. Regarded as one of the best species for hedges. Spines long and stout. Hardy to lat. 63° 26′ [Schuebeler]. Fruit edible.

Cratægus Mexicana, Mocino and Sesse. (*Mespilus Mexicana,* C. Koch.)

A shrub, hardy in England. The fruit is of about one inch size and edible.

Cratægus oxyacantha, Linné.

The ordinary Hawthorn or White Thorn or Quick. Europe, North-Africa, North- and West-Asia. In Norway it grows to lat. 67° 56′; Professor Schuebeler found the plant to gain still a height of 20 feet in lat. 63° 35′. Recorded here as one of the most eligible

among deciduous hedge-plants, safe against pastoral animals. The wood is considered one of the best substitutes for boxwood by engravers. The flowers are much frequented by bees for honey. C. monogyna (Jacquin) is a variety.

Cratægus parvifolia, Aiton.

Eastern North-America. For dwarf hedges. Spines long, slender, sharp and numerous.

Cratægus pyracantha, Persoon.

The Fire-Thorn. Southern Europe, South-Western Asia. This species is evergreen. It is likewise adapted for hedges, though slower in growth than the Hawthorn, but altogether not difficult to rear. Hardy in Norway to lat. 59° 55′ [Schuebeler]. Referred by Boissier to Cotoneaster. The allied C. crenulata (Roxburgh), the Himalayan White Thorn, is a large spinescent shrub, ascending there to an elevation of 8,000 feet.

Cratægus tomentosa, Linné,

South-Eastern States of North-America. Reaching a height of 20 feet. Fruit edible. The list of American Hawthorns is probably not yet exhausted by the species mentioned; all afford honey. Two species, C. rivularis (Nuttall) and C. Douglasii (Lindley), occur in California and Oregon.

Crepis biennis, Linné.

Europe, Western-Asia. Bosc regards this plant as useful for winter-pastures in cool climes, it keeping well green. The flowers afford food for bees.

Crithmum maritimum, Linné.

The real Samphire. Sea-shores of Western and Southern Europe, North-Africa and the Orient. A perennial herb. Settlers on the coast might readily disseminate and naturalise it. It is held to be one of the best plants for pickles, the young leaves being selected for that purpose.

Crocus sativus. C. Bauhin.

The Dye-Saffron. South-Eastern Europe and the Orient. The stigmata of this particular autumnal-flowering Crocus constitute the costly dye-substance. The best is collected from the flowers as they daily open in succession. The plant yields its product for three or four years. Spain produces annually from 200,000 to 300,000 lbs. of Saffron. The article is often largely adulterated before it is put on the market [Queenslander]. At an early stage of colonisation it would not be profitable to grow saffron commercially; but as the plant is well adapted for many extra-tropical countries or for high elevations within the tropics, it might be

planted out into various unoccupied mountain-localities with a final view to naturalise it, and to thus render it available from native sources at a later period. It has additional claims on account of its prettiness. Noted as a bee-plant even by the ancients [Muenter]. In Norway it is grown as far north as lat. 67° 56'. Likes calcareous light soil.

Crocus serotinus, Salisbury. (*C. odorus,* Bivona.)

South-Europe. This species also produces saffron rich in pigment. The bulbs of several are edible. See also Maw's splendid work, specially devoted to this genus.

Crotalaria Burhia, Hamilton.

Beloochistan, Afghanistan, Scinde. This perennial herb grows in arid places, and like the following yields Sunn-fibre.

Crotalaria juncea, Linné.*

The Sunn-Hemp. Indigenous to Southern Asia and also widely dispersed through tropical Australia. An annual herb, rising under favorable circumstances to a height of 10 feet. In the colony of Victoria, Sunn can only be cultivated in the warmest and moistest localities. It comes to maturity in four or five months. The plant can also be grown as a fodder herb for cattle. It requires rich, friable soil. If a superior soft fibre is desired, the plant is pulled while in flower; if strength is the object the plant is left standing until it has almost ripened its seeds. The steeping process occupies about three days. For the purpose of obtaining branchless stems it is sown closely. Cultivated in the Circars, according to Roxburgh, to feed milch-cows.

Crotalaria retusa, Linné.

Asia, America and Australia within and near the tropics. A perennial herb. Its fibre resembles that of C. juncea, and is chiefly used for ropes and canvas. Others of the multitudinous species of Crotolaria deserve to be tested for their fibres.

Croton lacciferus, Linné.

Ceylon, up to 3,000 feet. Valuable for the warmer forest-regions of temperate climes, on account of its peculiar exuding lac-resin.

Croton Tiglium, Linné.

Insular and Continental India, extending to China. A small tree. The very powerful purgative Croton-oil is expressed from the seeds. The plant bears prolifically in the northern part of N.S.W.

Crozophora tinctoria, Necker.

South-Europe, North-Africa and the Orient. An annual herb. The turnsole-dye is prepared by exposing the juice to the air, or by treating it with ammonia.

Cryptomeria Japonica, D. Don.*

The Sugi or Japanese Cedar. Japan and Northern China. The largest tree in Japan, the trunk attaining 35 feet in circumference [Rein] and 120 feet in height. Stem long, clear, of perfect straightness; the plant is also grown for hedges; in Japan it yields the most esteemed timber, scented like that of Cedrela [Christie]. It requires forest-valleys for successful growth. The wood is durable, compact, soft and easy to work; more extensively utilised in Japan than any other. In the Azores the tree is preferred even to the Pinus Halepensis for timber-culture, on account of its still more rapid growth in that insular climate. Several garden varieties exist. Lives unprotected still at Christiania. Withstands gales.

Cucumis Anguria, Linné.

Wild in tropical America, but according to Sir Jos. Hooker and Prof. Naudin perhaps of African origin, all other species belonging to the eastern hemisphere. Annual. The fruit serves for pickles.

Cucumis cicatrisatus, Stocks.

Scinde, where it is called "Wungee." The edible ovate fruit is about 6 inches long. Deemed a wild form of C. Melo by Cogniaux.

Cucumis Citrullus, Seringe.* (*Citrullus vulgaris,* Schrader.)

Indigenous probably only in Eastern Africa. The Water-Melon. It is simply mentioned here, to indicate the desirability of naturalising it in any desert. In those of South-Africa it has become spontaneously established, and retained the characters of the cultivated fruit. The yield is much increased by irrigation; fruits up to 70 lbs. were obtained on the Murray-River [Clarson]. Vilmorin found that the seeds will keep fully six years.

Cucumis Colocynthis, Linné. (*Citrullus Colocynnthis,* Schrader.)

From the Mediterranean regions to India. An annual herb. The medicinal extract of colocynth is prepared from the small gourd of this species. Active principle: colocynthin.

Cucumis Melo, Linné.

The Melon. Originally from the country about the Caspian Sea, but some forms indigenous to India, northern and tropical Africa and tropical Australia, if really all the forms united by Cogniaux are con-specific. The best varieties might also be naturalised in sand-deserts, particularly in places where some moisture collects. Melons are marvellously prolific on the floating islands of some of the Asiatic lakes. According to Mr. Clarson, Rock- and Green Melons of 40 lbs. weight are obtained on the irrigated lands at Mildura, Murray-River. In seasons of drought the Muscat-Melon, introduced by the author into Central Australia, has borne fruit there more amply than any other variety. Vilmorin kept seeds for

more than ten years germinable. Some of the Bokhara-varieties are remarkably luscious and large. Apparently remunerative results have been gained in Belgium from experiments, to cultivate melons for sugar and treacle. The seeds thus obtained in quantity become available for oil-pressing. The root contains melonemetin. The Japanese C. Conomon (Thunberg) belongs to this species. Prof. Naudin investigated extensively the variability of this and allied plants. Some varieties of melons and pumpkins ripen in Scandinavia during the long summers there in the open air far north; all are annual.

Cucumis Momordica, Roxburgh.

Cultivated in India. It produces cucumbers 2 feet long, bursting slowly when ripe into several divisions. Young, the fruit is used like cucumbers, older like melons. Referred by Cogniaux to the varieties of C. Melo.

Cucumis sativus, Linné.*

The Cucumber. North-Western India. Cultivated in Hungary already before historic ages [De Candolle]. Indicated here merely for completeness sake, also because gherkin-pickling ought to become a more extended local industry. Dr. G. King brought under notice and Indian culture the Chinese Cucumber "Solly-Qua," which attains a length of 7 feet. It must be trained on walls or trellises, to afford to the fruit sufficient scope for suspension. For definitions of numerous varieties of Melons, Cucumbers and Gourds, as well as for full notes on their cultivation, see, irrespective of other references, G. Don's Dichlamydeous Plants III, 1-42. Seeds will retain their vitality for ten years or more [Vilmorin]. Cucumbers and gherkins are most richly produced under irrigation.

Cucurbita maxima, Duchesne.

Large Gourd or Pompion. Indigenous in South-Western America. Yields some sorts of pumpkins. Instances are on record of fruits having weighed over 2 cwt. This species also is eligible amongst other purposes for naturalization in hot desert-regions. The fruit serves for calabashes like that of Lagenaria vulgaris. The seeds will keep about six years. Professor Wittmack obtained seeds from ancient graves at Ancon.

Cucurbita Melopepo, Linné*

The Squash. May be regarded as a variety of C. Pepo. It wil endure storage for months. Wonderfully productive under irrigation.

Cucurbita moschata, Duchesne.

The Musky Gourd. Warmer parts of America, where it was much grown among Maize, prior to the advent of the Europeans [Wittmack]. A variety, much cultivated in Italy, produces fruit so large as occasionally to weigh 40 lbs. [Vilmorin].

Cucurbita Pepo, Linné*

The Pumpkin and Vegetable Marrow, as well as the Succade-Gourd. Both-Americas, as far north as Lake Huron, existing before Europeans came there [A Gray and H. Trumbull]. This or an allied species was in 1539 found in culture by Soto, on his arrival at the Mississippi, according to Professor Wittmack, who also obtained Pumpkin-seeds at Ancon from graves formed prior to the Spanish conquest. Its naturalisation in hot deserts would be a boon. The seeds on pressure yield a fixed oil; they are also anthelmintic. Most of the ornamental gourds are varieties of this species. This, with many other Cucurbitaceæ, yields much honey for bees. Pfister recommends the variety with large yellow fruit particularly for marmalade. The fruit of the perennial C. melanosperma (A. Braun) is not edible. Professor Naudin after long and careful study admits as species only C. Pepo, C. moschata and C. maxima.

Cudrania Javanensis, Trecul. (*Cudranus Amboinensis,* Rumph).

East-Australia, Southern and Eastern Asia to Japan, East-Africa. This climbing thorny shrub can be utilized for hedges. Fruit edible, of a pleasant taste; the root furnishes a yellow dye.

Cudrania triloba, Hance.

China. The leaves of this shrub serve as food for silkworms according to Mr. F. B. Forbes.

Cuminum Cyminum, Linnè.

North-Africa. The fruits of this annual herb are known as Cumin, and used for certain condiments, as also in medicine. Cuminum Hispanicum (Merat) is similar. Essential oil peculiar.

Cupania sapida, Cambessedes. (*Blighia sapida,* Koenig.)

The "Akee." Western tropical Africa. A tree, to 30 feet high, if not sometimes higher. Flowers so fragrant as to be worth distilling. Succulent portion of the fruit eatable, improved by frying. This Cupania may endure slight frost as some of its congeners. In Jamaica it is cultivated only up to an elevation of 3,000 feet [Fawcett]. Schumacher and Thonning gave, simultaneously with Cambessedes' designation, the name C. edulis to this species.

Cupressus Benthami, Endlicher.

Mexico, at elevations from 5,000 to 7,000 feet. A beautiful tree, reaching 60 feet in height. The wood is fine-grained and exceedingly durable. Rate of growth at Port Phillip as much 30 feet in height within 15 years. Professor C. Koch deems it identical with C. thurifera.

Cupressus fragrans, Kellogg.

The Californian Ginger-Pine or Oregon-Cedar. A tree, reaching 150 feet in height, with a clear trunk for 70 feet and a stem-diameter to 6 feet. Wood abounding in aromatic oil [J. Hoopes].

Cupressus funebris, Endlicher.

Thibet. The Weeping Cypress. Attains a height of 90 feet. One of the most eligible trees for cemeteries; can be grown from the lowlands of India to 7,000 feet or even higher,

Cupresses glauca, Larmarck.

The Cedar of Goa. It attains a height of 50 feet. Regarded as a state of the Himalayan C. torulosa (D. Don) by Sir Jos. Hooker, Oliver, Henriques and Wilkomm.

Cupressus Guadaloupensis, S. Watson.*

Guadaloupe-Island, California. A widely spreading or drooping tree; stem diameter to 5 feet [Palmer.] This has grown with extraordinary quickness in the lower mountains of Gippsland [H. Kjergaard].

Cupressus Lawsoniana, Murray (*Chamæcyparis Lawsoniana,* Parlatore).

California and Oregon. This splendid red-flowered Cypress grows to 150 feet in height, with a stem to 6 feet in diameter, and furnishes a valuable timber for building purposes, fragrant, clear, easily worked, free from knots, elastic and very durable [Sargent]; it is however to be avoided for cabinet-work on account of the soft and coloring resin permeating it [Dr. Kellogg]. Hardy to lat. 60° 15′ in Norway [Schuebeler].

Cupressus Lindleyi, Klotzsch.

On the mountains of Mexico. A stately Cypress, reaching a height of 120 feet. It supplies an excellent timber. Prof. C. Koch points out the very close affinity of this species to C. thurifera and restores its older name C. Coulteri (Forbes), suggesting that this Cypress may be derived from C. pendula (l'Héritier), which so long was termed inaptly C. Lusitanica.

Cupressus macrocarpa, Hartweg.* (*C. Lambertiana,* Gordon.)

California, from Monterey to Noyo, in the granite- as well as sandstone-formation; sometimes in Sphagnum-moors. This beautiful and shady tree attains to a height of 150 feet, with a stem of 9 feet in circumference, and is one of the quickest growing of all conifers, even in poor dry soil. Does well also on limestone-soil [Dr. H. Bennet]. One of the best shelter-trees on sea-sands, naturally following the coast-line, never extending many miles from the shore, and occurring in localities, where the temperature does not rise above 80° F., nor sink below the freezing point [Bolander]; nevertheless it proved even hardy in Christiania. Richer in its yields of tar than the Scotch Fir, according to American writers. Not to be planted on places, where stagnant humidity exists underground, nor where the soil is but little penetrable. Its nativity singularly limited.

Cupressus Nutkaensis, Lambert. (*Chamæcyparis Nutkaensis,* Spach; *Thuya excelsa,* Bongard.)

The Yellow Cedar or Cypress of Alaska and the neighboring States. Height of tree reaches 100 feet. Timber soft, pale, clear, durable, tough and close, also scented; worked with ease; used for boat-building and many other purposes; the bast for mats and ropes. Can be trimmed for hedge-growth. The Cypresses of the sections Chamæcyparis and Retinospora are now regarded by Sir Joseph Hooker and Mr. George Bentham as species of Thuya. Prof. C. Koch placed them, as did previously the author of this work, in the genus Cupressus.

Cupressus obtusa, F. v. Mueller. (*Retinospora obtusa,* Siebold and Zuccarini.)

The Hinoki of Japan. Attains a maximum-height of 130 feet; stem to 5 feet in diameter; a tree of longevity. It forms a great part of the forests at Nipon. Growing naturally between 1,200 and 4,200 feet elevation on the transition of the compact alluvial clays to eruptive granite [Dupont]. The bark is used for thatching, also for cordage and tow. The wood is pale-streaked and compact, assuming when planed a silky lustre. According to Mr. Christie, it is durable, close-grained and easily worked. It is selected in Japan for temples, further also much in use for boat-building, as it very long resists decay in water, also for railway-sleepers and various underground-work. There are varieties of this species with foliage of a golden and of a silvery-white hue. Hardy at New York, even in exposed localities. One of the finest of evergreen trees for the vicinity of dwellings. It resembles C. Lawsoniana, but excels it; it is also hardier and of more rapid growth [Rev. H. W. Beecher]. Easily multiplied from layers of the lower branches.

Two other Japanese Cypresses deserve introduction—namely C. breviramea (Chamæcyparis breviramea, Maximowicz) and C. pendens (Chamæcyparis pendula, Maximowicz).

Cupressus pisifera, F. v. Mueller. (*Chamæcyparis pisifera,* Siebold and Zuccarini.)

The Savara of Japan. It attains a maximum height of over 100 feet. Stem occasionally 5 feet in diameter. Very hardy like the foregoing, bearing the frosts of Norway quite to lat. 59° 55′ [Schuebeler]; of beautiful aspect and quick growth. There is also a variety with golden-yellow foliage. Less esteemed than C. obtusa; grows in about the same localities, but is content with poorer soil, and bears more heat [Dupont]. Prefers valleys for its location [Prof. Luerssen]. Wood principally used by coopers. This and the foregoing species were in 1871 referred to the genus Cupressus in an early edition of the present work.

Cupressus sempervirens, Linné.

The Common Cypress. South-Europe and South-Western Asia, on Mount Lebanon up to 5,000 feet. It is famous for the great age it attains, and for the durability of its timber, which is next to imperishable. Likes limestone-soil particularly. Doors from this wood in St. Paul's Church in Rome have lasted over 600 years. Its two forms namely C. pyramidalis (Targioni) and C. horizontalis (Miller) widely differ under culture. The tree attains in warm countries occasionally a height of 100 feet and a stem-girth of 9 feet. Hardy in England. Near Somma a cypress is still shown, which—so it is said—was renowned already at Cæsar's time on account of its great size. The wood is prized for trunks and boxes, as rendering the contents proof against most kinds of insects [Sir D. Brandis]. At present its wood is much sought for the manufacture of musical instruments. Young records the stem-circumference of a Cypress at Lago Maggiore at 54 feet, and this was known even 600 years ago as a venerable tree, thus far one of the few most favored trees in the whole creation.

Cupressus thurifera, Humboldt, Bonpland and Kunth.

Mexican White-Cedar; 3,000 to 4,500 feet above sea-level. A handsome pyramidal tree, upwards of 40 feet high. See C. Bentham.

Cupressus thuyoides, Linné. (*Chamæcyparis sphæroidea,* Spach; *Thuya sphæroidalis,* Cl. Richard.)

White Cedar of North-America; in moist and swampy ground. Height of tree reaching 80 feet; diameter of stem 3 feet. Of comparatively quick growth; endures shade well [B. E. Fernow]. The wood is reddish, light, clear, easy to split, soft and fragrant; it turns red when exposed to the air. Extensively used for a great variety of purposes—for boat-building, cooperage, railway-ties, particularly also shingles; it is fine-grained and easily worked. Mohr says, that the wood, when well seasoned, offers the finest material for hollow-ware. For furniture, it admits of a high finish and has a pleasing hue. The old wood resists the successions of dryness and moisture better than any other American Cypress hitherto tried. Circumferential rate of stem-growth in Nebraska 22 inches at 2 feet from the ground in 12 years [Furnas].

Cupressus torulosa, D. Don.

Nepal-Cypress. Northern India; 4,500 to 8,000 feet above the sea-level. Average ordinary height 40 feet, but much larger dimensions are on record; thus Dr. Stewart and Major Madden mention a tree 150 feet in height and 17 feet in stem-girth. The reddish fragrant wood is as durable as that of the Deodar-Cedar and highly valued for furniture. The tree prefers lime-stone soil. Splendid for wind-breaks and tall hedges. Sir D. Brandis thinks, that it may attain an age of 1,000 years. See C. glauca.

Curcuma longa, Linné.

"Turmeric." Tropical Asia. The clime of some regions of Japan proved warm enough for rearing this plant, which for ornament's sake alone deserves attention. Hardy at Moreton-Bay [Fr. Turner]. Turmeric is an ingredient of curry-powder, and is also used for tingeing chemical test-paper; it consists of the pounded root. It is exported to the value of £100,000 annually from India.

Curtisia faginea. Aiton.

South-Africa. A tree, attaining 40 feet in height. The wood is heavy, tough and durable; the Caffirs use it for their assagais. It answers well for superior furniture, tools, and is not surpassed there by any other wood for the construction of waggons, to be used in a hot and dry country. (See "Indian Forester," 1885.)

Cyamopsis psoraloides, De Candolle.

Southern Asia. The "Guar." This annual is mentioned by Dr. Forbes Watson among the plants, which furnish throughout the year table-beans to a portion of the population of India. The plant is however more important as a good cattle-fodder [Dr. Watt].

Cyathea medullaris, Swartz.

Malayan Archipelagos, Islands in the south-pacific ocean, south-eastern Australia and New Zealand, there to 47°. Admitted into this work, as an extensive export exists in root-stems of tree-ferns, this species being one of the most hardy.

Cycas Normanbyana, F. v. Mueller.

A noble Queensland-species, deserving introduction, and capable of being shipped to long distances in an upgrown state without emballage. Tall stems of Cycas media, brought to conservatories abroad, after eight years' dormancy sprouted into foliage [J. C. Schmidt].

Cycas revoluta. Thunberg.

The Japan Pine-Palm. The trunk attains in age a height of about 6 feet, and is rich in sago-like starch. The slow growth of this plant renders it only valuable for scenic decorative culture;

it endures the climate of Melbourne without protection. Cycas media (R. Br.) may also prove hardy, and would be a noble horticultural acquisition, as it is the most gigantic of all Cycadeæ, attaining a height of 70 feet in tropical East-Australia. C. Siamensis (Miquel) will endure a temperature occasionally as low as the freezing point. Like the Zamia-stems, the trunks of any Cycas admit of translocation, even at an advanced age; and like the stems of many kinds of tree-ferns, they can be shipped on very long voyages packed as dead goods in closed wood-cases, deprived of leaves and soil, for subsequent revival in conservatories, as shown many years ago by the writer of this work. The Macrozamias can be associated with the hardier palms in gardens, M. spiralis advancing naturally southward to the 37th degree. One genuine Zamia occurs as indigenous in Florida, several in Mexico are extra-tropical, while Z. Chiqua (Seemann), or a closely allied species, ascends to 7,000 feet in Central-America. The genuine species of Encephalartos, all from South-Africa, also endure the night-frosts of Melbourne perfectly well.

Cymopterus glomeratus, De Candolle,

North-America, in the Missouri-region. Root edible [Dr. Rosenthal].

Cynara cardunculus, Linné.

The Cardoon. At the Mediterranean Sea, extending to the Canary-Islands. A perennial herb. The bleached leaf-stalks serve as esculents. The foliage employed also as a substitute for rennet. This as well as the following will come to perfection in Norway to lat. 63° 52′ [Schuebeler]. Readily raised from seeds. The root also edible [Vilmorin].

Cynara Scolymus, Linné.

The Artichoke. South-Europe and North-Africa. The receptacles and the base of the flower-scales well known as a vegetable. The plant is perennial, and here chiefly mentioned as entitled to extended culture, grouped with other stately plants. Several other species are worthy of cultivation. In Italy Artichokes are much grown under olive-trees, to utilize spare-ground. The plant is greatly benefited in cultivation by a dressing with sea-weed or any other manure containing sea-salt [G. W. Johnson]. The leaves serve instead of rennet. Seeds will keep for several years. To preserve good varieties, sprouts are replanted, from which all the buds except two or three of the strongest are removed. Low-lying ground and somewhat peaty soil can be utilised for this plant [Vilmorin].

Cynodon Dactylon, Cl. Richard.* (*Capriola Dactylon*, Adanson.)

Widely dispersed over the warmer parts of the globe, thus as indigenous reaching the northern parts of the colony of Victoria; stretching also into Middle Europe and West-England. Hardy in Norway to lat. 63° 52' [Schuebeler]. Passes under the names of Bermuda-Grass, Indian Couch-Grass, Doab, Doorba or Doorva and Bahama-Grass. An important grass for covering bare, barren land, or binding drift-sand, or keeping together the soil of abrupt declivities, or consolidating earth-banks against floods; suffocates weeds. It is not without value as a pasture-grass; resists extreme drought, and may become of great importance to many desert-tracts, as it keeps alive even in the hottest and driest parts of Central Australia; also one of the best of all grasses in tropical countries for hay [Eggers]. Placed likewise above all other grasses for pasture and stable-value in Louisiana [Seiss]. In seasons of dearth pastural animals will even unearth the roots of this grass, greatly relishing them. Difficult to eradicate, but for permanent pastures on exhausted land in mild climes not surpassed. Clings with pertinacy to any soil it gets hold of. The dispersion is best affected by the creeping, rooting stems cut into short pieces; each of these takes root readily, but it can be also disseminated, and grains are now always in the seed-markets. In arable land this grass, when once established, cannot easily be subdued. The stems and roots are used in Italy for preparing the Mellago graminis. Roxburgh already declared this grass to be by far the most common and useful for pastures of India, particularly in the drier regions; that it flowers all the year, and that it forms three-fourths of the food of the cows and horses there. Excellent also as a lawn-grass in mild climates, on account of its dwarf and creeping growth and as enduring trampling pertinaciously. Well fitted along with small creepers to cover verdantly the soil as well as the margin and sides of tubs containing palms or fern-trees or other larger plants. Chemical analysis, made very early in spring, gave the following results:—Albumen 1·60, gluten 6·45, starch 4,00, gum 3·10, sugar 3·60 per cent. [F. v. Mueller and L. Rummel].

Cynosurus cristatus, Linné.

The Crested Dogstail-Grass. Europe, Northern Africa, Western Asia. A perennial grass, particularly valuable as withstanding drought, the root penetrating to considerable depth. The stems can also be used for bonnet-plaiting. Though inferior in value for hay, this grass is well adapted for permanent pasture, as it forms dense tufts without suffocating other grasses or fodder-herbs. Recommended also as an admixture to lawn-grasses by Hein and others. The percentage of nutriment in this grass is recorded as very high by Dr. Stebler. Mr. W. F. Salmon finds this the best grass for the hilly country of Gippsland, increasing the carrying capabilities of his land at least a sheep per acre above other

grasses tried by him. It is there relished by pasture-animals, which is not always the case in drier localities.

Cyperus corymbosus, Rottboell.

India, North-Australia, Madagascar. This stately perennial rush may be chosen to fringe our lakes and ponds. It is extensively used for mats in India. The variety C. Pangorei furnishes the material for the Tennevilly-matting [W. T. Dyer].

Cyperus esculentus, Linné.

Southern Europe, Western Asia, various parts of Africa. Produces the "Chufa" or Ground-Almond, an edible root, which contains about 27 per cent. of starch, 17 per cent. of oil and 12 per cent. of saccharine substance; other (French) analyses give 28 per cent. oil, 29 starch, 14 sugar, 7 gum, 14 cellulose. This plant does not injuriously spread like the C. rotundus, and can be reared on sand-land, though in rich soil the harvest is far more plentiful. The tubers, of which as many as 100 to 150 may be obtained from each plant, are consumed either raw or cooked. Hogs root them up for food. The oil surpasses in excellence of taste all other oils used for culinary purposes. The tubers are a fair substitute for coffee, when properly roasted; the root-crop is available in from four to six months. The plant may become important in the most dreary and arid desert-countries through naturalisation. In Norway it can be grown to lat. 67° 56' [Schuebeler]. The root of the North-American C. phymatodes (Muehlenberg) is also nutty. C. esculentus and C. exaltatus (Retzius) are used for mats [Dr. G. Watt].

Cyperus Papyrus, Linné.

The Nile-Papyrus, wild in various regions of Africa. Attains a height of 16 feet. Though no longer strictly a utilitarian plant, as in ancient times, it could scarcely be passed on this occasion, as it ought to become valuable in the horticultural trade. Its grand aspect recommends it as very decorative for aquatic plantations.

Cyperus Syriacus, Parlatore.

The Syrian or Sicilian Papyrus. This is the Papyrus-plant, usual in garden-cultivation. It found its way to Australia first through the action of the writer of this work. The plants in the Melbourne Botanic Garden attain a height of 8 feet, but suffer somewhat from frost. Other tall decorative Cyperi deserve introduction, for instance: C. giganteus (Rottboell) from the West Indies and Guiana; these kind of plants being hardier than the generality of others of the same genus from the tropics.

Cyperus tegetum, Roxburgh. (*C. Malaccensis*, Lamarck.)

North-Eastern Africa, India, China and North-Australia. This Galingale-Rush might be naturalised on river-banks to obtain

material for the superior mats made of it in Bengal. The fresh stems are slit longitudinally into three or four pieces, each of which curls round while drying, and can then be worked into durable and elegant mats. In China it is cultivated like rice, but in brackish ground only, where narrow channels will allow the water to flow in and out with the rising and receding tide [Hance and Dilthey]. Consul W. M. Cooper reports, that in 1878 about 15 millions of Ningpo-hats were exported, nearly as many in 1887. In making these hats the stems are used whole.

Cyperus textilis, Thunberg. (*Cyperus vaginatus, R. Brown.*)

Widely dispersed over the Australian continent, also occurring in Southern Africa. It is restricted to swampy localities, and thus is not likely to stray into ordinary fields. In the colony of Victoria it is one of the best indigenous fibre-plants, and it is likewise valuable as being with ease converted into pulp for good writing-paper, as shown by the author many years ago. Its perennial growth allows of regular annual cutting. The natives on the Murray-River use this as well as Carex tereticaulis (F. v. M.) for nets.

Cytisus prolifereus, Linné fil.

Canary-Islands. The "Tagasaste." A fodder-shrub for light dry soil: finally tall, rather intolerant to frost and drought [Dyer]. Valuable also for apiarists. In some places it was found, that horses and cattle dislike this plant as nutriment. It grows quickly again when cut.

Cytisus scoparius, Link. (*Spartium scoparium*, Linné.)

The Broom-Bush. Europe, North-Asia; wild in Norway to 58° N. Of less significance as a broom-plant than as one of medicinal value. It can also be used for tanning purposes. Most valuable for arresting drift-sand. Easily raised from seeds. A yellow dye (scoparin) is obtainable from this shrub. The liquid alkaloid sparteina is a prompt cardial tonic [Prof. Bartholow].

Cytisus spinosus, Lamarck.

Countries around the Mediterranean Sea. This bush forms a strong prickly garden-hedge, handsome when closely clipped [W. Elliott].

Dacrydium Colensoi, Hooker.

New Zealand. A beautiful tree, growing to 50 feet in height and producing hard and incorruptible timber. Chiefly eligible for cool humid forest-regions.

Dacrydium cupressinum, Solander.

New Zealand. Native name, Rimu; the Red Pine of the colonists. This stately tree attains the height of 200 feet, and furnishes a hard and straight-grained wood, very lasting for rails, but readily decaying in waterworks. Professor Kirk recommends the timber on account of its great strength for girders and heavy beams anywhere under cover. With other conifers of New Zealand particularly eligible for forest-valleys. A most suitable tree for cemeteries, on account of its pendent branches. The bark possesses fair tan-properties.

Dacrydium Franklini, J. Hooker.

Huon-pine of Tasmania, where it is endemic; only found in moist forest-recesses, and thus might be planted in ferntree-gullies of South-Eastern Australia also. Height of tree sometimes 100 feet; stem-circumference reaching 20 feet. The wood is light, extremely close-grained, highly esteemed for various artisans' work. It is the best of Australasian woods for carving, also extensively used for the rougher kinds of xylography, in the manufacture of pianos and best cabinet-work, also for building select boats. The tree is not of celerity of growth, nor resists severe frosts.

Dacrydium Kirkii, F. v. Mueller.

New Zealand. The "Manoao." A pyramidal tree, attaining 80 feet in height; stem-diameter to 4 feet. Timber of a reddish colour and extreme durability [Professor Kirk]. Bears seeds abundantly.

Dactylis glomerata, Linné.*

Europe, North-Africa, Northern and Middle Asia, The Cocksfoot-grass. One of the best of perennial, tall, vigorous pasture-grasses, adapted as well for dry as moist soil, thus even available for wet clays; particularly eligible for hay. Will live under the shade of trees in forests; fit also for coast-sands. Resists drought better than most of the ordinary culture-grasses. Mr. A. R. Crawford kept an individual plant for 16 years, and it still continued to increase. Ascends the Pyrenees to 9,000 feet [Boissier], and is indigenous in Norway to lat. 68° 50′ [Schuebeler]. Its yield of foliage is rich and continuous, but its stems are hard; the same plants live through a long series of years, and can be cut twice or thrice each season without application of manure. It is generally liked by cattle, unless when by understocking or neglect it has been allowed to become rank. Langethal observes: "What the Timothy-grass is for the more dry sandy ground, that is the Cocksfoot-grass for more binding soil, and no other (European) grass can be compared to it for copiousness of yield, particularly if the soil contains a fair quantity of lime. It grows quickly, again after the first cutting, and comes early on in the season. It is much grown in

New Zealand for harvesting the seeds. The nutritive power of this grass is of first class. The chemical analysis, made very late in spring, gave the following results: Albumen 1·87, gluten 7·11, starch 1·05, gum 4·47, sugar 3·19 per cent. [Von Mueller and Rummel].

Dactylis litoralis, Willdenow. (*Aeluropus laevis,* Trinius.)

From the Mediterranean sea to Siberia. This stoloniferous grass can be utilized for binding coast-sands; but it is of greater importance still in sustaining a Kermes-insect (Porphyrophora Hamelii), which produces a beautiful purple dye [Simmonds].

Dalbergia latifolia, Roxburgh.

India, up to cool but not cold regions. A deciduous tree, attaining a height of 80 feet. The wood tough and heavy, in local request for ornamental furniture, yokes, wheels, ploughs, knees of boats; its color from nut-brown to dark-purplish, streaked and spotted with lighter hues [Brandis, Gamble]. It has fetched as much as £13 10s. per ton in England [Watt].

Dalbergia Melanoxylon, Guillemin and Perrottet.

Tropical Africa, extending to Southern Egypt. A small tree with spiny branches; the wood described variously as blackish and purplish; according to Colonel Grant used for arrow-tips, wooden hammers and other select implements.

Dalbergia Miscolobium, Bentham.

Southern Brazil. This tree supplies a portion of the Jacaranda-wood [Tschudi].

Dalbergia nigra, Allemao.

Brazil, down to the Southern Provinces. A tall tree, likely to prove hardy in warmer extra-tropic regions. It yields a portion of the Jacaranda- or Palisander-Wood, also Caviuna-Wood, which for rich furniture have come into European use. Several Brazilian species of Machærium afford, according to Saldanha da Gama, a similar precious wood, also timber for water-works and railway-sleepers, particularly M. incorruptibile (Allemao), M. legale and M. Allemai (Bentham).

Dalbergia Sissoo, Roxburgh.*

The Indian Sissoo-tree, extending to Afghanistan, ascending to elevations of 5,000 feet, attaining a height of 80 feet. It may be worthy of test, whether in localities almost free of frost, particularly along sandy river-banks, this important timber-tree could be naturalised, the Sissoo bearing occasional frosty cold better than the Sâl. Brandis found the transverse strength of the wood greater than that of teak and sâl; it is very elastic, seasons well,

does not warp or split, is easily worked and takes a fine polish. It is also durable as a wood for boats. The tree is easily raised from seeds or cuttings, and is of quick growth. The seeds are produced copiously. The supply of its wood has fallen short of the demand in India. Colonel Campbell-Walker states, that in the Punjàb artificial rearing of Sissoo is remunerative at only 15 inches annual rainfall, with great heat in summer and occasional sharp frosts in winter; but irrigation is resorted to at an annual expense there of four shillings per acre. Sterile land is by the Sissoo-planting greatly ameliorated.

Dammara alba, Rumph. (*D. orientalis,* Lambert; *Agathis loranthifolia,* Salisbury.)

Agath-Dammar-Pine. Indian Archipelagus and mainland. A splendid tree, up to 100 feet high, with a stem to 8 feet in diameter. straight and branchless for two-thirds in length. It is of great importance on account of its yield of the transparent Dammar-resin, extensively used for varnish.

Dammara Australis, Lambert.* (*Agathis australis,* Salisbury.)

Kauri-Pine. North-Island of New Zealand. This magnificent tree measures, under favorable circumstances, 180 feet in height and exceptionally 17 feet in diameter of stem; the estimated but perhaps overrated age of such a tree being 700 to 800 years. It furnishes an excellent, remarkably durable timber, straight-grained, and much in use for masts, boats, superior furniture, casks, rims of sieves, and is particularly sought for decks of ships, lasting for the latter purpose twice as long as the deal of many other pines. It is also available for railway brake-blocks and for carriages, and regarded as one of the most durable among timbers of the Coniferæ. Braces, stringers and tie-beams of wharves remained, according to Professor Kirk, for very many years in good order under much traffic. In bridge-building also the Kauri-timber gave excellent results; it can likewise be used advantageously for the sounding-boards of pianofortes. Kauri-wood is also used for light handles of many implements and for various instruments, including stethoscopes, for wool-presses, the body-work of waggons, butter-casks, brewers' vats; further, in shipbuilding for bulwarks, and also for the sides of boats. In strength it is considerably superior to Baltic Deal. Kauri ought to be extensively introduced into our denser forests. Auckland alone exports about £100,000 worth of Kauri-timber annually. It is easily worked, and takes a high polish. This tree yields besides the Kauri-resin of commerce, which is also largely obtained from under the stems. The greatest part is gathered by the Maoris in localities formerly covered with Kauri-forests; pieces weighing a ton have been found in such places. The value of this resin, as exported from New Zealand in 1883, was £359,936, it 1885 it was £299,762, in 1888, £380,933, the London

market-price being about £50 the ton. The varnish made of it is almost colorless. Recent vast destruction of Kauri-forests through fire render the establishing of this tree elsewhere all the more imperative.

Dammara macrophylla, Lindley.

Santa-Cruz Archipelagos. A beautiful tree, often 100 feet high, resembling D. alba.

Dammara Moorei, Lindley.

New Caledonia. Height of tree about 50 feet.

Dammara obtusa, Lindley.

New Hebrides. A fine tree, resembling D. Australis, reaching 200 feet in height, with a long clear trunk.

Dammara ovata, C. Moore.

New Caledonia. This tree is rich in Dammar-resin.

Dammara robusta, C. Moore.* (*Agathis robusta,* J. Hooker.)

Queensland-Kauri. A tall tree, known only from the vicinity of Rockingham's Bay, the mainland at Wide Bay and Fraser's Island. It thrives well even in open, exposed, dry localities at Melbourne. Height attaining 180 feet; largest diameter of stem 6 feet; wood free from knots and easily worked. Market value £3 10s. for 1,000 superficial feet of timber. As much as 12,000 feet (superficial) of good timber have been cut from one tree, that not being the largest. The species closely allied to the Indian D. alba, and yields likewise Dammar-resin.

Dammara Vitiensis, Seemann.

In Fiji. Tree to 100 feet high; probably identical with Lindley's D. longifolia.

Danthonia bipartita, F. v. Mueller.

From the interior of New South Wales and Queensland to West-Australia. Available as a tender-leaved and productive perennial grass, particularly for any desert-regions.

Danthonia Cunninghami, J. Hooker.

New Zealand. A splendid alpine fodder-grass, with large panicles; it attains a height of 5 feet, and forms tussocks. Pasture-animals relish the young foliage and the flower-masses [J. Buchanan].

Danthonia nervosa, J. Hooker. (*Amphibromus Neesii,* Steudel.)

Extra-tropical Australia. One of the best perennial nutritious Swamp-grasses.

Danthonia penicillata, F. v. Mueller.*

The Wallaby-grass. Extra-tropical Australia and New Zealand, ascending to alpine elevations. Mr. A. N. Grant mentions this as the most gregarious of grasses in Riverina, though after seeding early in summer it becomes parched, until it pushes afresh after the first autumnal rains. It is most easily disseminated. Dr. Curl found this perennial grass useful for artificial mixed pasture. Its principal value is in spring. Noted as very valuable in its native localities. Deserving of methodic rearing. Will live where cocksfoot and rye-grass succumb for want of humidity or nourishment [Th. Mason].

Danthonia robusta, F. v. Mueller.

Australian Alps. Forms large patches of rich forage near or at the very edge of glaciers and may therefore possibly endure the winters of Middle Europe. The tall D. rigida (Raoul) of New Zealand is closely allied. Prof. Hieronymus mentions D. picta (Nees) as a superior grass of extra-tropic South-America for sheep-pastures.

Datisca cannabina, Linné.

From Greece to Upper India. A perennial herb; the leaves and roots are used in medicine, and also yield a superior yellow dye.

Daucus Carota, Linné.*

The Carrot. Europe, North-Africa, extra-tropical Asia, east to Japan, north to the Shetland-Islands, but succeeds also as a culture plant in equatorial countries [Cantley] matures seeds well even in the desert-regions of Central Australia [Rev. H. Kempe], where it yields a crop at any part of the season. Biennial. Admits of naturalisation along shores. In Norway it is grown to lat. 70° 22′ [Schuebeler]. Beyond ordinary culinary utilisation it serves for the distillation of alcohol and a peculiar oil. Large-rooted varieties as well as the herb give a good admixture to stable-fodder. The fresh root acts as an anthelmintic. Within the tropics Carrots are a crop of the cool season. At Singapore the Shorthorn-variety thrives best [H. N. Ridley]. Carrot-treacle can also be prepared from the root. Requires lime in the soil for its prolific culture. The chemical substances carotin and hydrocarotin are derived from it. Mess. Dippe in Quedlinburg keep about 130 acres under culture merely for carrot-seeds. These will retain their vitality for a few years ordinarily preserved.

Debregeasia edulis, Weddell.

The Janatsi or Teon-itsigo of Japan. Berries of this bush edible; fibre valuable for textile fabrics. A few Indian species, with fibre resembling that of Boehmeria, ascend the Himalaya for several thousand feet, and may therefore be very hardy—namely: D. velu-

tina, D. Wallichiana, D. hypoleuca. The latter extends to Abyssinia, where it has been noticed at elevations of 8,000 feet. D. dichotoma occurs on mountains in Java.

Decaisnea insignis, J. Hooker and Thomson. (*Slackea insignis,* Griffith.)

Himalaya from 6,000 to 10,000 feet elevation. This showy shrub or miniature-tree produces fruit full of juicy pulp of pleasant sweetness.

Dendrocalamus Brandisii, Munro*

Tenasserim, Martaban and Pegu, up to elevations of 4,000 feet. Height of stem reaching to 120 feet. Likes lime-stone soil. Locally much used for buildings, affording posts, rafters, flooring material and shingles; fit also for many utensils, among them buckets [Sir D. Brandis]. Internodes sometimes over a foot long.

Dendrocalamus giganteus, Munro.*

Malacca and the adjacent islands. Habit of Gigantochloa maxima; therefore one of the mightiest of all Bamboos. It continues constantly to add stems from its root, several hundred sometimes belonging to the same tuft. Stems reach a height of 100 feet and a circumference of 33 inches; the joints are occasionally as much as 18 inches long and the walls an inch thick [Dr. Trimen]. Locally much used for rural buildings, furnishing posts, rafters, flooring material and shingles [Brandis]. Buckets and many other domestic utensils are readily made of this Bamboo. D. criticus of Burmah attains a height of 30 feet, and ascends to 3,000 feet [Kurz].

Dendrocalamus longispathus, Kurz.

British Burmah, where with D. calostachyus (Kurz) it ascends to about 3,500 feet; the former rises to a height of 60 feet. D. membranaceus (Kurz) attains there nearly the same height.

Dendrocalamus Hamiltoni, Nees.

Himalayas, between 2,000 and 6,000 feet. Height reaching 60 feet. The young shoots of this stately Bamboo are edible in a boiled state [Hooker]. It endures great cold as well as dry heat [Kurz]. D. Hookeri (Munro) is a closely allied species.

Dendrocalamus strictus, Nees.*

India, extending to Burmah. Grows on drier ground than Bamboos generally. Its strength and solidity render it fit for many select technic purposes. It attains a height of 100 feet, and occasionally forms forests of its own. It endures great cold as well as dry heat [Kurz]. Useful for the consolidation of embankments

on account of the network of fibrous roots [Fernandes]. Readily raised from seed. This and D. Hamiltoni are almost annually seeding [Gamble], which is exceptional among Bambusaceæ.

Desmodium acuminatum, De Candolle.

Eastern North-America. With D. nudiflorum (D.C.) mentioned by C. Mohr as a nutritive plant for stock, and particularly adapted for forest-soil.

Desmodium triflorum, De Candolle.*

In tropical regions of Asia, Africa and America. A densely matted perennial herb, alluded to on this occasion as recommendable for places too hot for ordinary clover, and as representing a large genus of plants, many of which may prove of value for pasture. Dr. Roxburgh already stated that it helps to form the most beautiful turf in India, and that cattle are very fond of this herb. Colonel Drury informs us, that it springs up on all soils and situations, supplying the place of Trifolium and Medicago there. D. Canadense (D.C.) is also an excellent fodder-herb [Rosenthal].

Desmodium uncinatum, De Candolle.

"Chili-Clover." From North-Mexico to Chili and Uruguay. A somewhat shrubby plant of easy dissemination; valuable for forage [Dr. W. Hillebrand].

Dicksonia Billardierii, F. v. Mueller.* (*D. antarctica,* La Billardière; *Cibotium Billardierii,* Kaulfuss.)

South-Eastern Australia, New Zealand. This tree-fern is mentioned here, as it is the very best for distant transmission, and endures some frost. It attains a height of 40 feet. Hardy in the Island of Arran with D. squarrosa and Cyathea medullaris [Rev. D. Landsborough.] This species above all others should be disseminated in warmer extra-tropical countries, thus with us in West-Australia. Important also as commercial plants among fern-trees are Cyathea medullaris, of South-Eastern Australia and New Zealand; Cyathea dealbata, the Silvery Tree-fern and C. Smithii, from New Zealand only; because when upgrown their shipment is not attended with the same difficulty as that of the tall Alsophila Australis (which attains 60 feet) and numerous other tree-ferns, about 200 species of which are now known. Those mentioned are among the hardiest of this noble kind of plants. D. Billardieri, D. squarrosa and Alsophila Colensoi extend to 46° 30′ S. in New Zealand according to Mr. T. Waugh. Professor Kirk records from Stewart-Island in latitude 47° 20′ Dicksonia squarrosa, Cyathea Smithii and C. medullaris. The latter attains occasionally a weight of three tons according to Mr. Dall. The vestiture of their frond-stalks serves as a styptic. Anthelmintic properties, which may exist in these and many other ferns, have not yet been searched

for. The fresh dust-like spores should be scattered through moist forest-valleys, to ensure new supplies of these superb forms of vegetation for the next century. D. Billardierii is nowhere antarctic. Frond-fragments, as not quickly shrivelling, in extensive demand for marketable table-bouquets.

Digitalis purpurea, Dodoens.

The Foxglove. Western Europe. A biennial and exceedingly beautiful herb of great medicinal value, easily raised. In Norway it grows to lat. 63° 52′ [Schuebeler]. Chemical principles: digitalin, digitaletin and three peculiar acids [Wittstein.] Bees must be kept away from this plant.

Dimochloa Andamanica, Kurz.

Andamans. A scandent Bamboo, rising to fully 100 feet. Should be of particular value for scenic culture. D. Tjankorreh (Buese) extends from Java to the Philippines, ascends to 4,000 feet elevation, but is not so tall as the other species.

Dioscorea aculeata, Linné.*

The Kaawi-Yam. India, South-Sea Islands. Stem prickly, as the name implies, not angular. Leaves alternate, undivided. It ripens later than the following species, and requires no reeds for staking. It is propagated from small tubers. This yam is of a sweetish taste, and the late Dr. Seemann regarded it as one of the finest esculent roots of the globe. Will keep for nearly a year; weight to 8 lbs. A variety of a bluish hue, cultivated in Central America (for instance at Caraccas), is of very delicious taste. The fresh tubers contain about 15 per cent. starch [Dr. Th. Peckolt.]

Dioscorea alata, Linné.*

The Uvi-Yam. India and South-Sea Islands. The stems are four-angled and not prickly. The tubers, of which there are many varieties, will attain under favorable circumstances a length of 8 feet, and the prodigious weight of 100 pounds. This species and the preceding are the two principal kinds cultivated in tropical countries. D. alata is in culture supported by reeds. It is propagated from pieces of the old root, and in warm climes comes to perfection in about seven months. The tubers may be baked or boiled. It is this species, which has been successfully cultivated in New Zealand and also in the Southern States of North-America. A variety or allied species with branched tubers is mentioned by Peckolt as Angola- Yam, containing about 24 per cent. starch. It may be only cultivated perhaps in Africa.

Dioscorea atropurpurea, Roxburgh.

Southern India. Root elongated, attaining a weight of 2 lbs., of very nice taste. Starch about 18 per cent. [Peckolt], sugar 7 per cent.; thus richer in sugar than any other species.

Dioscorea Brasiliensis, Willdenow.

From Guiana to Brazil. Tuber ovate, to nearly 1 foot diameter. Particularly lauded by Dr. Theo. Peckolt as palatable, but not so rich in starch as some other species.

Dioscorea bulbifera, Linné. (*D. sativa,* Linné partly.)

Southern Asia, east as far as Japan, also in the South-Sea Islands, North- and tropical East-Australia, likewise recorded from tropical Africa. Stem cylindrical, not prickly. The acrid root requires soaking before boiling. The plant has proved hardy in the Southern States of North-America. Starch is very profitably obtainable from the tubers.

Dioscorea dodecaneura, Velloso.

Southern Brazil. Tubers attain a weight of 3 lbs., of excellent taste. Starch about 18 per cent. [Peckolt].

Dioscorea fasciculata, Roxburgh.

Continental India. This species is there cultivated to a considerable extent, not only for food, but also to make starch. The tubers are of the size of a large potato, which they resemble in mealiness and flavor, and are highly esteemed [Dr. G. Watt].

Dioscorea glabra, Roxburgh.* (*D. Batatas,* Decaisne.)

The Chinese Yam. From India to China. The hardiest of all. Not prickly. The root is known to attain a length of 4 feet, with a circumference of 14 inches, and a weight of about 14 lbs. The inner portion of the tuber is of snowy whiteness, of a flaky consistenee and of a delicious flavor; preferred by many to potatoes, and obtainable in climes too hot for potato-crops. The bulblets from the axils of the leaf-stalks, as in other Dioscoreas, serve as sets for planting, but the tubers from them attain full size only in the second year. The upper end of the tubers offers ready sets, but there are dormant eyes on any portion of the surface of the tubers [Sir Samuel Wilson, General Noble]. First grown in Australia by the author in 1858. A remarkably hardy species; its yam-root keeps well [Vilmorin]. Not so easily dug up as those of some other species.

Dioscorea globosa, Roxburgh.

India. Roxburgh states this to be the most esteemed yam in Bengal.

Dioscorea hastifolia, Nees.

Extra-tropical Western Australia, as far south as 32°. It is evidently one of the hardiest of the yams, and on that account deserves particularly to be drawn into culture. The tubers are largely consumed by the local aborigines for food. The only plant, on which they bestow any kind of cultivation, crude as it is. Fit for arid situations, but fond of lime.

Dioscorea Japonica, Thunberg.

The hardy Japan-Yam. Not prickly. The material here for comparison is not complete, but seems to indicate, that D. transversa and D. punctata (R. Br.) are both referable to D. Japonica. If this assumption should prove correct, then we have this yam along the coast-tracts of North- and East-Australia, as far south as latitude 33°. In Australia we find the wild root of good taste and large size; the tubers are eaten by the savages raw when young, roasted when aged [E. Palmer].

Dioscorea nummularia, Lamarck.

The Tivoli-Yam. Continental and insular India, also South-Sea Islands. A high-climbing prickly species, with opposite leaves. Roots cylindrical, as thick as a man's arm; their taste exceedingly good. Roxburgh's plant of this name seems quite different.

Dioscorea oppositifolia, Linné.

India and China. Not prickly. One of the edible yams.

Dioscorea pentaphylla, Linné.

Continental and insular India, also South-Sea Islands. Likewise a good yam. A prickly species, with alternate divided leaves.

Dioscorea piperifolia, Humboldt and Bonpland.

From Panama to Peru and Brazil. The tubers keep particularly well, and are often smoked for preservation. Starch about 26 per cent. [Dr. Th. Peckolt].

Dioscorea purpurea, Roxburgh.

India. In Bengal considered next best to D. alata and D. globosa.

Dioscorea quinqueloba, Thunberg.

Japan, and there one of several yam-plants with edible tubers. Among numerous congeners are mentioned as providing likewise root-vegetables: D. esurientum (Fenzl) from Guatemala, D. tuberosa and D. conferta (Vellozo) from South-Brazil, D. Cayennensis (Lamarck) from tropical South-America, D. triphylla (Linné) from tropical Asia, D. deltoidea (Wallich) from Nepal. Of these and many other species the relative quality of the roots and their adaptability to field-cultivation require to be more fully ascertained.

Dioscorea spicata, Roth.

India. Roots used like those of other species.

Dioscorea subhastata, Velloso.

Southern Brazil. Tuber roundish, attaining a weight of 6 lbs.; mucilaginous. Starch about 18 per cent. [Peckolt].

Dioscorea tomentosa, Koenig.

Ooyala-Yam. India. The nomenclature of some of the Asiatic species requires further revision.

Dioscorea trifida, Linné fil.

Central America. One of the yams there cultivated. Various other tuberous Dioscoreæ occur in tropical countries, but their respective degrees of hardiness, taste and yield are not recorded or ascertained. The length of the warm season in many extra-tropical countries is probably sufficient for ripening all these yams. Prof. Philippi records 28 species from Chili, all therefore extra-tropic.

Diospyros Ebenum, Koenig.*

Ceylon, where it furnishes the best kind of Ebony-wood, occurring also in southern continental India. It is not uncommon up to an elevation of 5,000 feet in Ceylon, according to Dr. Thwaites; hence I would recommend this large and valuable tree for test-plantations in warm extra-tropical lowlands forest-regions, where also D. quæsita and D. oppositifolia, the best Calamander-trees, and D. melanoxylon should be tried. Many other species of Diospyros could probably be introduced from the mountains of various tropical regions, either for the sake of their ebony-like wood or their fruit. Black Ebony-wood sinks in water. The price in England ranges from £8 to £20 per ton, from 700 to 1,000 tons being imported into Britain annually for pianoforte-keys, the string-holders of musical instruments, the fingerboard and tail-piece of violins, sharp note-pieces of pianos, harmoniums and cabinet-organs, and other select purposes. The following species, some of which may prove hardy, yield Ebony-wood, according to Hiern: *India*—D. Ebenum, Koen., D. melanoxylon, Roxb., D. silvatica, Roxb., D. Gardneri, Thw., D. hirsuta, L. fil., D. discolor, Willd., D. Embropteris, Thw., D. Ebenaster, Retz., D. montana, Roxb., D. insignis, Pers., D. Tupru, Hamilt., D. truncata, Zoll., D. ramiflora, Wall; *Africa*—D. Dendo, Welw., D., mespiliformis, Hochst.; *Mauritius*—D. tesselaria, Poiret; *Madagascar*—D. haplostylis, Boivin, D. microrhombus, Hiern. C. B. Clarke enumerates for British India alone 59 species of Diospyros.

Diospyros Kaki, Linné fil.*

The Date-plum or Persimmon of China and Japan, also Khasya, Assam and Burma. A rather slow-growing tree, hardy at Port Phillip; comes into bearing when about five years old. The fruit is yellow, orange, pink or dark-purple, variable in size, but seldom larger than an ordinary apple; it can readily be dried on strings. A hard and a soft variety occur. It has ripened as far north as Philadelphia [Saunders]. The most famed varieties are, according to the Rev. Mr. Loorins: Ronosan, Nihon, Micado, Daimaio, Taikoon, Yamato, the latter particularly large and saccharine, and with the Jogen-variety mostly used for drying. In Sydney the

favorite varieties for culture are the Yemon and the Jane-Nashi [H. A. James]; both are also much liked in the United States. In Japan this is thought to be the best native fruit [Christy]; attains one pound in weight. There are also seedless varieties. Dried Kaki-fruit is considered superior to figs. For drying the fruit is peeled; it requires a month to exsiccate. The Hyakuma-variety when shrivelled measures as much as 4 by 3 inches [Jarmain]. The green fruits serve as medicinal astringents [Dupont]. Hiern counts as varieties D. Schitze (Bunge) and D. costata (Carrière).

Diospyros Lotus, Linné.

From Northern China to the Caucausus. The ordinary Date-plum. The sweet fruits of this tree, resembling black cherries, are edible and also used for the preparation of syrup. The wood, like that of D. chloroxylon, is known in some places as Green Ebony. It resembles Mottled Ebony; it must not however be confounded with other kinds, such as are furnished by some species of Excœcaria, Nectandra and Jacaranda. This tree endures the winters of Northern Germany [C. Koch]; in the Crimea it rises to 40 feet [Loudon].

Diospyros Texana, Scheele.

Mexico and Texas. Tree, reaching a height of 30 feet; fruit globose, black, luscious [A. Gray]. The wood serves as a substitute for that of the Turkey box [Prof. Sargent].

Diospyros Virginiana, Linné.*

The North-American Ebony or Parsimon or Persimmon, indigenously restricted to the South-Eastern States. A tree, reaching 70 feet in height, sends suckers up from the roots. Wood heavy, very hard, blackish or brownish, valuable for shuttles instead of boxwood [Jos. Gardner]; for turnery, also shoe-lasts [Sargent]; for shafts one of the very best [Michaux]. The stem exudes a kind of gum. The sweet variety yields a good table-fruit. Ripens fruit to 41° North in Illinois [Bryant]. Endures the winters of Northern Germany [C. Koch]. Hot summers promote the early ripening and sweetness of the fruit, the delicious taste not alone depending on early frost, as final sweetness depends on chemical decomposition. The flowers yield honey. The species is of very close affinity to D. Lotus, as remarked by A. Gray, which endures the clime of Northern Germany also.

Diplothemium campestre, Martius.

Southern Brazil. A dwarf Palm of dry regions. The sweetish pulpy outer covering of the small fruits is edible. D. maritimum (Martius) grows naturally on sandy sea-coasts, and can be cultivated in the open air as far south as Port Jackson [C. Moore], fruiting well there.

Diposis Bulbocastanum, De Candolle.

Chili. The tubers of this perennial herb are edible.

Dipsacus fullonum, Linné.

Fuller's Teasel. Middle Asia. A tall biennial herb. The thorny fruit-heads are used for fulling in cloth-factories. The import into England during one of the latter years was valued at £5,000. The plant is most easily reared. The use of these Teasels has not yet been superseded by any adequate machinery. The young leaves can be used as food for silkworms [Thorburn]. The flowers are rich in nectar for honey [A. J. Cook], which is of excellent quality [Quinby].

Dirca palustris, Linné.

Eastern States of North-America, extending to Canada. An ornamental forest-shrub, the tough bark of which is serviceable for straps and whipcords.

Distichlis maritima, Rafinesque. (*Festuca distichophylla,* J. Hooker.)

North- and South-America, extra-tropical Australia. This dwarf creeping grass is of great value for binding soil in arid places, forming rough lawns, edging garden-plots and covering coast-sand.

Dolichos biflorus, Linné*

Tropical and sub-tropical Asia, Africa and Australia. An annual herb, the Horse-Gram of South-India, where it is extensively grown. Colonel Sykes got over 300 seeds from a moderate-sized plant. Dr. Stewart saw it cultivated up to 8,000 feet. Content with poor soils. Thrives in very hot weather, with a minimum rainfall. Well adapted for stable-pulse and also useful for fodder and as green manure [Dr. G. Watt]. D. uniflorus (Lamarck) seems a variety.

Dolichos gibbosus, Thunberg.

South-Africa. This woody climber is one of the most eligible for covering rustic buildings with a close and almost ever-flowering vegetation.

Dolichos Lablab, Linné.*

India, probably from thence only spread widely through the tropics. An annual herb, sometimes lasting through several years, cultivated up to 7,000 feet in the Himalayas; ripening its fruit at Port Phillip. The young pods, as well as the ripe seeds, of several varieties available for culinary use, it delights in rich soil, and ripens in hot countries within three months; its yield is about forty-fold, according to Roxburgh. At Port Darwin its produce has been 180-fold [M. Holtze]. The whole plant forms excellent stable-feed for cattle.

Dorema Ammoniacum, D. Don.

From Persia extending to Afghanistan and Turkestan, up to 4,000 feet. A tall perennial herb, yielding the gum-resin Ammoniacum, which might be obtained from plants introduced, especially as this plant will grow in dry regions.

Dovyalis zizyphoides, E. Meyer.

South-Africa. A thorny shrub. Berries used for a delicious preserve [Mrs. Barber]. So also the fruits of D. celastroides (Sonder).

Dracæna cinnabrina, B. Balfour.

Socotra. Attains 25 feet height and three feet stem-thickness. One of the most remarkable plants extant, for scenic culture particularly eligible, the branches short terminal and almost horizontally crowded, giving the tree an umbrella-shaped outline. Produces like D. Draco, D. Ombet (Kotschy and Pryritsch) from Nubia and D. schizantha (Baker) from Samoli red dye-resin.

Dracæna Draco, Linné.

The Dragonblood-Tree of the Canary-Islands. An imposing feature in scenic horticulture; it yields one kind of Dragonblood-resin. The famed Dragon-tree of Teneriffe, measured in 1831, showed 46 feet stem-circumference, and even at the commencement of the 15th century was celebrated for its age and large proportions. A Dracæna is cultivated on Kilimanjaro up to 7,000 feet for hedges [H. Johnston].

Dracocephalum Moldavica, Linné.

Northern and Middle Asia. An annual showy scent-herb; also of some medicinal value and particularly for culinary condiment.

Drimys Winteri, R. and G. Forster.

Extra-tropical South-America. The Canelo of Chili, sacred under the name of Boighe to the original inhabitants. Attains in river-valleys a height of 60 feet. The wood never attacked by insects [Dr. Philippi]. Bark used for medicinal purposes. The Australian and New Zealand species may be equally valuable. D. aromatica (F. v. M.) is particularly burning-spicy, even in its foliage.

Duboisia Hopwoodii, F. v. Mueller.

The Pitury. Inland desert-regions from New South Wales and Queensland to near the west-coast of Australia. This shrub deserves cultivation on account of its highly stimulating properties. D. myoporoides (R. Br.) of East-Australia and New Caledonia has come into use for ophthalmic surgery. The alkaloid of the latter, duboisin, is allied to piturin, and important as a mydriatic [Ban-

croft]. It is held by Ladenberg to be closely allied to Hyoscyamin in chemical constitution and physiologic effect. The tree attains in deep forest-glens a height of 60 feet [Ralston], but flowers even as a shrub.

Duvaua longifolia, Lindley.

La Plata-States. This shrub and the allied D. latifolia, called Molle there, yield foliage rich in tannin (about 20 per cent.), which as it does not give any color to leather, is much valued for particular currying [Dr. Lorentz].

Dypsis pinnatifrons, Martius.

Madagascar. This dwarf Palm proved hardy in Sydney, together with Copernicia cerifera [C. Moore].

Ecbalium Elaterium, Richard.

The Squirting Cucumber. Mediterranean regions and Orient. An annual. The powerful purgative Elaterium is prepared from the pulp of the fruit. Chemical principles: elaterid, elaterin, hydroelaterin.

Echinocactus Fendleri, Engelmann.

Mexico. A species attractive for its large rosy flowers and, like the red-flowered E. gonacanthus, E. Simpsoni, E. conoideus, E. phœniceus, E. viridiflorus, E. viviparus and E. paucispineus, among the most hardy of North-American Cacteæ [E. G. Loder].

Echinops sphærocephalus, Linné.

Southern Europe and temperate Asia. This perennial tall herb is very recommendable as a bee-plant; its leaves have some medicinal value; may however endanger pasturage as an unwelcome weed.

Echium candicans, Linné fil.

Madeira. This showy shrub, with the allied E. fastuosum (Jacquin) is an exquisite honey-plant; other species deserve in this respect also attention.

Ectrosia Gulliveri, F. v. Mueller.

North-Eastern Australia. A pretty but annual grass, useful for covering stony slopes in dry exposed localities [Bailey].

Ehrharta diplax, F. v. Mueller. (*Microlæna avenacea,* J. Hooker.)

New Zealand. This tall perennial grass is fond of woodlands, and deserves introduction elsewhere. It is likely to prove a rich pasture-grass. A few Australian species, particularly of the section Tetrarrhena, are readily accessible, and so indeed also the South-

African Ehrhartas, all adapted for a warm temperate clime; the majority perennial, and several of superior rural value. Ehrharta caudata (Munro) is indigenous to Japan.

Ehrharta longiflora, Smith.

South-Africa. Easily disseminated and, like other perennial species from the same part of the world, fit to grow in sand-land as a pasture-grass. Eagerly consumed by cattle [Cole].

Ehrharta stipoides, La Billardière.*

Extra-tropical Australia, also New Zealand. Often called Weeping-Grass. A perennial grass, which keeps beautifully green all through the year. For this reason its growth for pasturage should be encouraged, particularly as it will live on poor soil. Mr. W. H. Bacchus, of Ballarat, considered it nearly as valuable as Kangaroo-grass, and in the cool season more so. He finds it to bear overstocking better than any other native grass, and to maintain a close turf. Hence it is praised by Mr. O. Tepper as a lawn-grass. High testimony of the value of this grass is also given by Mr. Rankin, of Gippsland, after many years' experiments. However it does not always seed copiously. The chemical analysis, made in spring, gave the following results: Albumen 1·66, gluten 9·13, starch 1·64, gum 3·25, sugar 5·05 per cent. [F. v. Mueller and L. Rummel.]

Elæagnus hortensis, Bieberstein.

From South-Europe and North-Africa to Siberia and China, ascending in the Himalayas up to 10,000 feet. The fruits of this shrub, known under the name of Trebizonde-dates, are used in Persia for desert. Flowers highly fragrant [G. W. Johnson]. The fruit of E. latifolia (Linné) is also edible [Watt].

Elæagnus parvifolius, Royle.

From China to the Himalayas. This bush has been introduced into North-America as a hedge-plant, and according to Professor Meehan, promises great permanent success, as it has already achieved a high popularity in this respect. In Norway hardy to lat. 59° 55′ [Schuebeler]. Several other species might well be experimented on in the same manner.

Elæagnus longipes, A. Gray.*

Japan. The "Goumi." The fruits of this species are edible, of a particular and pleasant flavor, and especially adapted for confectionery. This bush resists much frost as well as drought, and bears in prodigious abundance almost throughout the year [Joseph Clarté]. It can be struck from cuttings, and comes into bearing in the third year.

Elæis Guineensis, Jacquin.*

The "Oil-palm" of Western tropical Africa. Height to 40 feet; foliage superb, the leaves occasionally reaching 15 feet in length. A well-developed fruit-spike may attain a weight of 40 lbs., and on it up to 800 fruits may be counted, each of the size of a walnut; the outer portion of the fruits almost of lardlike consistence; through boiling yields the commercial oil fresh for food or for soap and candle-manufacture. This palm likes a coast-clime. At Port Curtis ripens fruits [Edgar]; how much farther outside the tropics it will bear, remains here yet to be ascertained. For mere scenic culture it would doubtless thus succeed in a comparatively cool clime. The import of the fat-like oil of this palm into Britain during 1886 was 1,004,419 cwt., valued at £1,050,459; during 1889 it was 1,031,440 cwt., valued at £1,091,922. The present price is £20 the ton.

Elegia nuda, Kunth.

South-Africa. A rush, able with its long roots to bind moving sand; it also affords good material for thatching [Dr. Pappe]. Many of the tall Restiaceæ of South-Africa would prove valuable for scenic effect in gardens and conservatories, and among these may specially be mentioned Cannamois cephalotes (Beauvois).

Elionurus hirsutus, Munro.

This tall grass is illustrated by Mr. Duthie among the fodder-grasses of N.W. India. It grows on poor sandy soil. The seeds are used for food by the natives of Bikanir [Dr. Watt].

Elephanthorrhiza Burchelli, Bentham.

South-Africa. The huge club-footed roots of this somewhat shrubby plant are extraordinarily rich in tannin [Prof. McOwan]. All grazing animals like the foliage much; it starts from the roots again after frost [Mrs. Barber]. An allied species is E. Burkei.

Eleusine Coracana, Gaertner.*

Southern Asia, east to Japan, ascending the Himalayas to 7,000 feet. Though annual, this grass is worthy of cultivation on account of its height and nutritiveness. It is of rapid growth, and the produce of foliage and seeds copious. Horses prefer the hay to any other dry fodder in India, according to Dr. Forbes Watson. The large grains can be used like millet. E. Indica (Gaertner) only differs as a variety. It extends to tropical Australia, and is recorded also from many other tropical countries, but thrives well even as far as Port Phillip.

Eleusine stricta, Roxburgh.

India. The increase of grain of this annual grass in rich soil is at times five-hundredfold. E. Tocusso (Fresenius) is a valuable

kind from Abyssinia, seemingly allied to E. stricta. The Arabian and Himalayan E. flagellifera (Nees) is perennial. Other species of Eleusine are deserving of trial.

Elymus arenarius, Linné.* (*Hordeum arenarium,* Ascherson.)

The "Sea-Lyme" Grass. Europe and North-Asia, on sand coasts, growing in Norway to lat. 71° 7′. One of the most important and vigorous of grasses for binding drift-sand on the sea-shores. Endures being gradually covered with sand, but not so completely as Psamma. The North-American E. mollis (Trinius) is allied to this species.

Elymus condensatus, Presl.*

The Bunch-Grass of British Columbia and California, extending to lat. 58°. This is favorably known as adapted for sand-land. Prof. Bolander says, that it does excellent service in fixing soil on steep banks. Mr. W. Gorlie noted it to bear severe frost, as much as 0° F. Bunches become fully a yard in diameter and bear stalks up to 10 feet high, so that in annual bulk and weight of produce it surpasses all British pasture-grasses. It is also earlier than any of them, and its young growth never suffers from spring-frosts; moreover it is highly nutritious and greedily eaten in all its stages by stock. This grass should have some claim for adoption in scenic culture.

Elymus Virginicus, Linné.

Eastern North-America. Perennial, easily spreading, but fit for river-banks; of some fodder value [C. Mohr].

Embothrium coccineum, R. and G. Forster.

From Chili to the Straits of Magellan. The Notra or Ciruelillo. A tree of exquisite beauty, but seldom reaching above 30 feet in height. The wood is utilized for furniture. E. lanceolatum is merely a variety [Dr. Philippi]. The equally gorgeous E. emarginatum of the Peruvian Andes and E. Wickhami (F. v. M.) from Mount Bellenden-Ker of North-Queensland, deserve, with the East-Australian allied Stenocarpus sinuatus (Endlicher), a place in any sheltered gardens or parks of the warm temperate zone.

Encephalartos Denisonii, F. v. Mueller. (*Macrozamia Denisonii,* Moore and Mueller.)

New South Wales and Queensland, in the littoral forest-tracts. This noble Pine-palm is hardy as far south as Melbourne, and with E. spiralis, E. Preissii and the South-African species to be regarded as a most desirable acquisition to any garden scenery in mild zones. All admit of translocation even when of large size and when many years old. The lifted stems, with an unusual tenacity of life, sometimes remain dormant for several years. After removal they can be shipped in close cases as dead goods, the leaves being previously

cut away, but such shipments should not be exposed to severe frosts on transit. Encephalartos-stems rotting from below can be saved by cutting away the whole diseased portion and then again plunging the stem after amputation in to the soil [Dyer]. Seeds have kept germinable for 6 years [Dall]. Where naturally these Pine-palms abound, an excellent starch may profitably be got from their stems.

Engelhardtia spicata, Blume.

The spurious Walnut-tree of the mountains of Java, Burmah and the Himalayas up to 6,000 feet. It reaches a height of 200 feet. Wood pale-red, hard and heavy, manufactured into the solid cart-wheels and large troughs, which are in use throughout the Sunda-Islands [Brandis]. The bark is rich in tan-substance [Roxburgh].

Epicampes macroura, Bentham.

Mexico. This grass, like some of its congeners, furnishes the "Broom-root," the fibre of which is exported from Vera Cruz to the annual value of about £60,000 [D. Morris].

Eremophila longifolia, F. v. Mueller.

Desert-regions throughout Australia. In the hot season this tall bush or small tree affords food to sheep in desert-tracts, when grass and herbage fail [A. N. Grant]. Sheep browse on many other species of this highly ornamental genus. All resist drought and great climatic heat. A crude, somewhat peculiar tar is copiously and easily obtained from the wood [Hon. Phil. King]. Hypnotic properties are ascribed to the foliage, which opinion needs however yet confirmation.

Eremurus aurantiacus, Baker.

Afghanistan, 7,000 to 9,000 feet. The leaves of this liliaceous plant form for two months in the year almost the sole vegetable, on which the natives of Hariab depend; it is an agreeable food, crisp and somewhat hard, but neither tough nor fibrous [Dr. Aitchison]. Likely to become valuable as a spring-vegetable. The young leaves of E. spectablis (Bieb.) are eaten, either fresh or cooked [Dr. Stewart].

Erianthus fulvus, Kunth.

Interior of Australia. A sweet perennial grass, of which cattle are so fond as to eat it closely down, and thus cause it to die out [Bailey]. Readily raised by re-dissemination.

Erianthus Japonicus, Beauvois.

Japan. Bears frosts of 0° F. [Gorlie] Stems woody at the base, reaching a height of 6 feet, with spikes nearly a foot long. The striped-leaved variety is particularly decorative.

Eriochloa polystachya, Kunth.

In tropical and sub-tropical regions around the globe. Perennial. Endures moderate cold in South-Queensland, and affords fodder all the year round [Bailey]. It resists drought, and is fattening and much relished by stock [Dr. Curl]. Answers particularly well for a hot and arid clime [H. S. Hills]. E. punctata (Hamilton) and E. annulata (Kunth) are varieties.

Eruca sativa, Lamarck.

From Southern Europe to Central Asia, ascending the Himalayas to 10,000 feet. An annual herb, not unimportant as an oil-plant; much cultivated in some parts of Siberia for its seed [Dr. A. Regel]. Also grown to a considerable extent in the Punjab for fodder [Dr. G. Watt].

Ervum Lens, Linné.* (*Lens esculenta,* Moench; *Lathyrus Lens,* Petermann.)

The Lentil. South-Europe, South-Western Asia. Reared up to an elevation of 11,500 feet in India. Under culture in Hungary prior to historic ages. Annual, affording in its seeds a palatable and very nutritious food. The variety microspermum is especially praised by Dr. Heldreich. A calcareous soil is essential for the prolific growth of this plant. The leafy stalks, after the removal of the seeds, remain a good stable-fodder. The variety called the Winter-Lentil is more prolific than the Summer-Lentil. Valuable as honey-yielding for bees. Seeds will retain their vitality for about four years [Vilmorin]. The "Revalenta Arabica" consists mainly of lentil-flour.

Eryngium maritimum, Linné.

Europe, North-Africa, South-Western Asia. This perennial herb deserves dissemnation on sandy oceanic shores. Root of medicinal value. Young shoots serve as a substitute for asparagus [Dr. Rosenthal] so those of E. campestre (Linné), a plant of similar geographic range.

Eryngium pandanifolium, Chamisso.

South-Brazil, Paraguay, Misiones and Chaco. This or an allied species, called "Caraguata," with bromeliaceous habit, yields there textile fibre, which is long and silky [Kew Report. 1877, p. 37; Gard. Chron., 1882, p. 431, E. H. Egerton].

Erythroxylon Coca, Lamarck.*

Peru and Eastern Bolivia. This shrub is famed for the extraordinary stimulating property of its leaves, which pass under the names of Spadic and Coca. They contain two alkaloids, cocain and hygrin; also a peculiar tannic acid. The cocain has become of great importance in medicine, as a topical anæsthetic, particularly in ophthalmic surgery. In the native country of the plant its leaves have for ages been in use for chewing, to stave off hunger, thirst, sleep and fatigue [Capt. G. Harrison]; also for allaying local pain. They are also chewed by the Peruvians for the purpose of increasing the endurance of fatigue during long pedestrian

journeys. The leaves might also be kept available on board of ships, to sustain strength in severe trials of sea-life, The plant is fit for dry frostless climes. Succeeds well in Natal [J. M. Wood]. According to Mr. G. Peppe it can be multiplied readily from cuttings. An enormous quantity is annually collected and sold. The leaves have lately come also into use for a liqueur. Mr. Christy mentions the use of the leaves for counteracting the effect of opium; they seem also to prevent sea-sickness. Recommended recently as an antidote to snake-poison. The moderate consumption of this plant seems to leave no ill effect. The Peruvians mix the leaves with the forage of mules, to increase their power of enduring fatigue. A good harvest produces about 900 lbs. on an acre [Dr. Weddell]. The total annual production is about 40,000,000 lbs., valued at £2,000,000 [Dyer] all consumed in South-America. Whether any of the many other species of Erythroxylon possesses similar properties in the same proportion has as yet only been partially ascertained.

Eucalyptus Abergiana, F. v. Mueller.

Northern Queensland. A stately tree, with unusually spreading branches of dense foliage. The quality of its timber has remained hitherto unknown, but the species will probably prove one of the most suitable among its congeners for tropical countries.

Eucalyptus amygdalina, La Billardière.*

South-Eastern Australia. Vernacularly known as Brown and White Peppermint-tree, Giant-Gumtree and as one of the Swamp-Gumtrees. In sheltered springy forest-glens attaining exceptionally to a height of over 400 feet, there forming a smooth stem and broad leaves, producing also seedlings of a foliage different from the ordinary form of E. amygdalina, which occurs in more open country, and has small narrow leaves and a rough brownish bark. The former species or variety, which has been called Eucalyptus regnans, represents probably the loftiest tree on the globe. Mr. J. Rollo of Yarragon measured a tree, which was 410 feet high. Another tree in the Cape Otway-ranges was found to be 415 feet high and 15 feet in diameter, where cut in felling, at a considerable height above the ground. Another tree measured 69 feet in circumference at the base of the stem; at 12 feet from the ground it had a diameter of 14 feet; at 78 feet a diameter of 9 feet; at 144 feet a diameter of 8 feet, and at 210 feet a diameter of 5 feet. Other trees are known with a stem-circumference of 66 feet at 5 feet from the ground. Prof. Wilson and Colonel Ellery obtained at Mount Sabine a measurement of 21 feet 8 inches in diameter of a stem, where cut, the length being 380 feet. Colonel Ellery had repeatedly reports of trees seven axe-handles in diameter, and he met a tree on Mount Disappointment with a stem diameter of 33 feet at about 4 feet from the ground. Similar colossal dimensions are recorded from Tasmania; indeed Tasman's carpenter was already astonished at the hugeness of the trees there. The wood is fissile, well adapted for *shingles, rails,* staves, inner building-material and many other

purposes, but it is not a strong wood. That of the smaller rough-barked variety has proved lasting for fence-posts. Bees draw much honey from the flowers of Eucalypts. La Billardière's name applies ill to any of the forms of this species. Plants raised on rather barren ground near Melbourne have shown nearly the same amazing rapidity of growth as those of E. globulus; yet, like those of E. obliqua, they are not so easily satisfied with any soil. In the south of France this tree grew to a height of 50 feet in eight years. It has endured the frosts of the milder parts of England, with E. Gunnii and E. cordata. In New Zealand it has survived the cold, where E. globulus succumbed. E. amygdalina, E. urnigera, E. coccifera, E. rostrata and E. corymbosa have proved more hardy than E. globulus, E. diversicolor, E. resinifera, E. longifolia and E. melliodora at Rome, according to the Rev. M. Gildas, E. coccifera being hardier than any other. Professor Ch. Naudin believes, that E. amygdalina will prove hardy along the western maritime districts of France as far north as Brittany; the ordinary variety proved also hardy in the mild climate of Arran [Rev. D. Landsborough] also along with E. globulus at Falmouth [G. H. Taylor], the typical rough-barked form enduring more frost than the sylvan form E. regnans. In Gippsland it ascends to an altitude of 4,000 feet. Mons. F. de Rochemache observes, that E. amygdalina grows nearly five times quicker in South-Europe than Pinus Laricio. The now well-known Eucalyptus-oil, the distillation of which was initiated by the writer, is furnished in greater or lesser proportion by all the different species. It was first brought extensively into commerce by Mr. Bosisto, who has the credit of having ascertained many of the properties of this oil for technic application. It is this species which yields more volatile oil than any other hitherto tested, and which therefore is largely chosen for distillation; thus it is also one of the best for subduing malarian effluvia in fever-regions, although it does not grow with quite the same ease and celerity as E. globulus. Dr. Curgenven found Eucalyptus-oil, combined with thymol and other antiseptics, highly efficacious in the treatment of scarlet-fever and other infectious diseases, especially as an external application. Fresh Eucalyptus-branchlets, particularly of E. amygdalina, should be daily placed into the sickroom of phthisic patients, best under the bedstead, the effect being not only antiseptic, but also sedative and to some extent hypnotic. Colonel Warren quotes from scripture in reference to the medicinal value of the Eucalypts: "The leaves of the tree shall be for the healing of the nations." The respective hygienic value of various Eucalypts may to some extent be judged from the average percentage of oil in their foliage, as stated below, and as ascertained by Mr. Bosisto, at the author's instance, for the Exhibition of 1862:—

E. amygdallina	...	... 3·313 per cent.	**volatile oil.**
E. oleosa ...	...	... 1·250 „	„
E. leucoxylon	...	... 1·060 „	„
E. goniocalyx	...	... 0·914 „	„
E. globulus	...	... 0·719 „	„
E. obliqua	...	... 0·500 „	„

The lesser quantity of oil of E. globulus is however compensated for by the vigor of its growth and the early copiousness of its foliage. The proportion of oil varies also somewhat according to locality and season. E. rostrata, though one of the poorest in oil, is nevertheless important for malaria-regions, as it will grow well on periodically inundated places and even in stagnant waters not saline. According to Mr. Osborne's experiments, initiated by myself, Eucalyptus-oils dissolve the following, among other substances, for select varnishes and other preparations: camphor, pine-resins, mastic, elemi, sandarac, kauri, dammar, asphalt, xanthorrhœa-resin, dragon's blood, benzoe, copal, amber, anime, shellac, caoutchouc, also wax, but not gutta-percha. These substances are arranged here in the order of their greatest solubility. The potash obtainable from the ashes of various Eucalypts varies from 5 to 27 per cent. One ton of the fresh foliage of E. globulus yields about $8\frac{1}{2}$ lbs. of pearl-ash; a ton of the green wood, about $2\frac{1}{4}$ lbs.; of dry wood, about $4\frac{1}{2}$ lbs. The kino of E. amygdalina is almost completely soluble, as well in alcohol as in boiling water, and contains at an average about 58 per cent. of tannin [Maiden]. For chemical determinations of tan-principles in bark and kino of various Eucalypts may also be referred to Prof. Wiesner's published early observations on material supplied by the writer of this work. For resins, tar, acetic acid, tannin and other products and educts of many Eucalypts, see various documents and reports of the writer, issued from the Melbourne Botanic Garden already, 1866. Professor Ch. Naudin has published quite recently a valuable treatise on the Eucalypts, which have been introduced into France and Algeria.

Eucalyptus Baileyana, F. v. Mueller.

South-Queensland and Northern part of New South Wales. A tree to about 100 feet high; bark remarkably tenacious [Bailey]. The timber splits easily, yet is tough and durable, thus locally used for fence-posts and similar purposes [A. Williams]. This species, unlike most of its congeners, can be grown to advantage on sandy soil. Branches more spreading and foliage more dense than of most other Eucalypts.

Eucalyptus botryoides, Smith.*

From East-Gippsland to South-Queensland. Vernacular name Bastard-Mahogany, and a variety called Bangalay, the latter generally found on coast-sands. One of the most stately among an extensive number of species, remarkable for its dark-green shady foliage. It delights in river-banks, but will thrive also on ground with stagnant moisture. Grows splendidly at the city of Algiers [Prof. Bourlier]. Stems attain a height of 80 feet without a branch and a diameter of 8 feet. The timber usually sound to the centre, adapted for water-works, wagons, particularly for felloes, also knees of boats. Posts formed of it are very lasting, as

no decay was observed in fourteen years; it is also well adapted for shingles. The Rev. Dr. Woolls, Mr. Kirton and Mr. Reader all testify to its general excellence.

Eucalyptus calopoylla, R. Brown.

South-Western Australia. where it is vernacularly known as Red Gumtree. More umbrageous than most Eucalypts and of comparatively rapid growth. In its native forests it has quite the aspect of the Eastern Bloodwood-trees. It succeeds well at the city of Algiers [Dr. Bourlier], also suited for mountainous regions of Ceylon. The wood is almost destitute of kino, when grown on alluvial land, but not so when produced on stony ranges. It is preferred to that of E. marginata and E. cornuta for rafters, spokes and fence-rails, also used for handles and agricultural implements; it is strong and light, but not durable underground. The bark is valuable for tanning, as an admixture to Acacia-bark; the seed-vessels of this and perhaps all other Eucalypts can be used for the same purpose. The stem of this tree may occasionally be observed to 10 feet in diameter; it is the only tree in West-Australia, which yields copiously the fluid and indurating Eucalyptus-kino; this is soluble in cold water to the extent of 70 to 80 per cent. This species will only endure a slight frost; its flowers are much frequented by the honey-bee. The kino-fluid from this tree might be used as a protection of wood, and perhaps other substances against decay.

Eucalyptus capitellata, Smith.

One of the Stringy bark-trees of South-Eastern Australia, extending into the dry mallee-country, attaining occasionally a height of 200 feet. The timber is principally used for fence-rails, shingles and rough building purposes. Kino soluble in water as well as in alcohol. This species might with advantage be raised on wet sandy land. Produces seed already when quite young.

Eucalyptus citriodora, Hooker.*

Queensland. Generally on sterile stony ridges. A handsome slender tree with a smooth white bark, supplying a useful timber, especially for piles and girders. Succeeded remarkable well at Lucknow [Ridley], also at Zanzibar, where it grows at a tremendous rate [Sir J. Kirk], and thrives also in Bengal. It is this species, which grows so well on the hot plains of the Magdalena River, attaining a height of 20 feet in two years, in regions subject to protracted drought [Dr. Masters]. According to notes of the late Mr Thozet, a trunk 40 feet long and 20 inches in diameter broke after a flexion of 17 inches, under a pressure of 49 tons. This species combines with the ordinary qualities of many Eucalypts the advantage of yielding from its fresh leaves a rather large supply of volatile oil (slightly more than one per cent.) of excellent lemon-like fragrance, in which respect it has, among

other 120 species of Eucalypts, only one rival. This oil has come already into commerce through Mr. Jeffries Tunbury's distillery at Port Curtis; it contains no Eucalyptol [Schimmel]. Fresh foliage splendid for strewing about rooms or placing in large vases for fragrance and sanitary purposes also. Very closely allied to E. maculata, and perhaps only a variety. Particularly adapted for a tropical jungle-clime. Dislikes frost.

Eucalyptus coccifera, J. Hooker.

Tasmania. Although only a subalpine form of E. amygdalina, it may for cultural purposes be regarded as a very distinct tree. Withstood the severest winters of Wimbleton [J. Colebrook].

Eucalyptus cordata, La Billardière.

Southern Tasmania. Maximum height, 50 feet; flowering in a shrubby state already. The variety E. urnigera (J. Hooker) is particularly hardy, and may become of sanitary importance to colder countries in malarian regions, the foliage being much imbued with antiseptic oil. Greatest height of E. urnigera 150 feet; stem-diameter to 6 feet [Abbott].

Eucalyptus cornuta, La Billardière.*

The Yate-tree of South-Western Australia. A large tree of rapid growth, preferring a somewhat humid soil. The wood is used for various artisans' work, and preferred there for the strongest shafts and frames of carts and other work requiring hardness, toughness and elasticity, and is considered equal to ordinary ash-wood. The tree appears to be well adapted for tropical countries, as Dr. Bonavia reports, that it attained a height of 8 to 10 feet in the first year of its growth at Lucknow, and that the plants did not suffer in the rainy season like many other Eucalypts. Thrives also particularly well at the city of Algiers [Prof. Bourlier]. The dry wood sinks in water. E. occidentalis (Endlicher) is the flat-topped Yate, an allied and equally valuable species of South-Western Australia. This species along with E. amygdalina, E. eugenioides, E. globulus, E. Gunnii, E. marginata, E. obliqua, E. rostrata E. Stuartiana and E. viminalis are mentioned by Bargellini to have well succeeded in Istria, where they were first introduced by the writer of this work.

Euclayptus corymbosa, Smith.*

The principal Bloodwood-tree of New South Wales and Queensland. A tree attaining large dimensions; it has a rough furrowed bark and a dark-reddish wood, soft when fresh, but very hard when dry; very durable under-ground, and therefore extensively used for fence-posts, rails, railway-sleepers and rough building-purposes. Fence-posts from this tree showed hardly any decay after 40 years [R. Crawford), but it is too much traversed by kino to serve for sawn-timber. The bark is rich in kino, which yields about 28 per cent. of tannic acid, while the percentage of tan in completely dried leaves is about 18 [Maiden].

Eucalyptus corynocalyx, F. v. Mueller.*

South-Australia, North-Western Victoria. The Sugar-Gumtree. A timber-tree, attaining a height of 120 feet, length of bole to 60 feet, circumference at 5 feet from the ground reaching 17 feet. The base of the trunk often swells out in regular tiers. The wood remarkably heavy, very dense, hard and strong, less liable to warp than that of many other kinds of Eucalyptus-wood [J. E. Brown]. It has come into use for fence-posts and railway-sleepers, naves and felloes. Its durability is attested by the fact, that posts set in the ground fifteen years, showed no sign of decay. The tree thrives well even on dry ironstone-ranges. Better than any other species in the waterless regions of the Wimmera [Dr. Rabe]. The sweetish and pleasantly odorous foliage attracts cattle, sheep and camels, which browse on the lower branches, as well as on saplings and seedlings. Scarcely any other Eucalypt is similarly eaten [J. E. Brown]. It should therefore be planted on cattle-and sheep-runs in arid districts, to furnish additional provender. In ordinary culture the writer does not find this species of quick growth; but Mr. Brown records that it has grown 7 to 8 feet in a year at Quorn, and that it is one of the most valuable of all trees for the dry and arid regions of South-Australia. It prefers however humid soil near water-courses, according to Mr. Tepper. Has withstood a temperature of 18° F. in the South of France [Naudin].

Eucalyptus crebra, F. v. Mueller.*

The narrow-leaved Ironbark-tree of New South Wales and Queensland. Wood reddish, hard, heavy, elastic and durable; much used in the construction of bridges and for railway-sleepers, also for wagons, piles, fence-posts. E. drepanophylla is a closely allied species of similar value, bearing an enormous strain. Both exude astringent gum-resin, resembling kino in appearance and property, to a considerable extent.

Eucalyptus diversicolor, F. v. Mueller.* (*E. colossea,* F. v. M.)

The Karri of South-Western Australia. A colossal tree, exceptionally reaching the height of 400 feet, with a proportionate girth of the stem. Mr. Muir measured stems nearly 300 feet long without a branch; widths of the timber as much as 12 feet can be obtained. Furnishes good timber for building, even for masts, likewise for planks; also valuable for shafts, spokes, felloes, fence-rails; it is elastic, but not so easily wrought as that of E. marginata. Mr. G. Simson does not deem the wood very durable, if exposed to moisture or if in contact with the ground. Its strength in transverse strain is equal to English oak. Very fair progress of growth is shown by the trees planted even in dry exposed localities in Melbourne. The shady foliage and quick growth of the tree promise to render it one of our best for avenues. In its native localities it occupies fertile, rather humid valleys and

resembles there in habit the E. amygdalina *var.* regnans of South-Eastern Australia. Proved well adapted for the mountains of Ceylon, and Professor Bourlier mentions it as one of the best at Algiers

Eucalyptus Doratoxylon, F. v. Mueller.

The Spearwood-tree of South-Western Australia, where it occurs in sterile districts. The stem is slender and remarkably straight, and the wood of such firmness and elasticity, that the nomadic natives wander long distances to obtain it as a material for their spears. It is not a large tree.

Eucalyptus eugenioides, Sieber.

One of the Stringybark-trees of Victoria and New South Wales. The tree is abundant in some localities, and attains considerable dimensions. Its useful fissile wood is employed for fencing and building purposes. Systematically the species is closely allied to E. piperita. Rails used for 40 years could be re-used in new posts [A. R. Crawford]. Kino soluble in water as well as in alcohol [J. H. Maiden].

Eucalyptus ficifolia, F. v. Mueller.*

South-Western Australia. Although not a tree of large dimensions, this splendid species should be mentioned for the sake of its magnificent trusses of crimson flowers, irrespective of its claims as a shady, heat-resisting avenue-tree, not standing in need of watering. It bears a close resemblance to E. calophylla.

Eucalyptus globulus, La Billardiére.*

The Blue Gumtree of Victoria and Tasmania; very rare in New South Wales, extending however naturally to New England; famed all over the world, and, with many other species, in most places first introduced directly or indirectly by the writer of this work, at the Mediterranean Sea nearly 40 years ago, there by the aid of Mons. Prosper Ramel. The tree is, among evergreen trees, of unparalleled rapid growth, and attains exceptionally a height of 300 feet, furnishing a first-class wood. Ship-builders can get keels of this timber 120 feet long; besides this, they use it extensively for planking and many other parts of the ship. Experiments on the strength of various woods, instituted by Mr. Luehmann and the author, proved the wood of the Blue Gumtree in average of eleven tests to be about equal to the best English oak, American white oak and American ash. The best samples indeed carried as great a weight as hickory in transverse strain, the ordinary kind about as much as that of Eucalyptus rostrata, and more than that of E. macrorrhyncha, E. Gunnii, E. Stuartiana and E. goniocalyx, but did not quite come up to the strength of E. melliodora, E. polyanthema, E. siderophloia and E. Leucoxylon. Bluegum-wood is also

very extensively used by carpenters for all kinds of out-door work, joists and studs of wooden houses; also for fence-rails, telegraph-poles, railway-sleepers (lasting nine years or more), for shafts and spokes of drays and a variety of other purposes. Mr. W. Tait, of Oporto, has recommended the wood for wine-casks, these requiring no soaking. The price of this timber in Melbourne is about 1s. 7d. per cubic foot, the weight of the latter when absolutely dry being from 43 to 46 lbs., equal to specific gravity 0·698-0·889 [F. v. M. and Rummel]. In South-Europe the E. globulus has withstood a temperature of 19° F., but succumbed at 17° F.; it perished from frost at the Black Sea and Turkestan, when young, according to Dr. Regel. Survived severe winters in mild sheltered places of Cornwall and Dorsetshire, also near Hastings [J. Colebrook]. Yet the sirocco does not destroy it. In Jamaica it attained 60 feet in seven years, on the hills; in California it grew 60 feet in eleven years, in Florida 40 feet in four years, with a stem of 1 foot in diameter. In some parts of India its growth has been even more rapid: at the Nilgiri-Hills it has been reared advantageously, where E. marginata, E. obliqua, E. robusta and E. calophylla had failed. Its growth was there found to be four times as fast as that of teak, and the wood proved for many purposes as valuable. Trees attained a height of 30 feet in four years; one tree, twelve years old, was 100 feet high, and 6 feet in girth at 3 feet from the ground; to thrive well there it wants an elevation of not less than 4,000 feet. It has succeeded particularly well at an elevation of from 2,500 to 7,000 feet in Central Mexico [Dr. Mariano Barcena.] In Algeria and Portugal it has furnished railway-sleepers in eight years, and telegraph-poles in ten years [Cruikshank]. At Urana it grew 15 feet in two years with irrigation [E. van Weenan]. On the mountains at Guatemala it attained, in twelve years a height of 120 feet and a stem-circumference of 9 feet [Boucard.] Will grow in favorable places on somewhat humid soil slightly over a foot a month at Port Phillip while young. The form of its leaves is only changed in the third year. The removal of the broad-leaved lower branches from plants two or three years old promotes much a healthy growth of the young trees The oil is now also in Algeria distilled on a large scale from the foliage for medicinal and technic purposes [Schimmel] and comes now into commerce also from the Neilgherry-Hills [S. G. Wallace]. According to the Rev. D. Landsborough, it proved hardy in the Isle of Arran. Mr. Ch. Traill notes it as thriving amazingly as far south as Stewart-Island. For window-culture in cold countries E. globulus was first recommended by Ucke; for culture in hospital-wards, to counteract contagia, by Mosler and Goeze. Eucalyptus leaves generate ozone largely for the purification of air; the volatile oil is very antiseptic. This tree, particularly when in an unhealthy state, is at Melbourne apt to be bored by the larvae of a large moth [Endoxyla Eucalypti] and also by two beetles [Hapatesus hirtus and particularly Phoracantha tricuspis], as noticed by Mr. Ch. French. Seeds will keep for several years, admit of easy transmission abroad, and germinate quickly; but a

tree of such celerity in growth and of such vast final dimensions wants necessarily soil open to great depth for full scope to its roots, to attain unimpaired development. Mr. T. Waugh observed in South-Island, New Zealand, that plants, raised from locally ripened seeds, proved hardier than those raised from Australian ordinary seed. The province of Roussillon, after its thousands of years of history, became in the aspect of its landscape completely changed within the last few years through Prof. Naudin extending therto also copiously E. globulus. At the height of 2,500 feet on the base of the South-European Alps and in localities too cold for olive-culture, E. globulus grew to 70 feet high in seven years [Naudin]. Regarding the comparative strength of this and various other timbers, the result of the tests, instituted and tabulated by the Carriage-timber Board of the Victorian Railway Department, much under the leading of Mr. Clement Hodgkinson, may be referred to in the Progress Reports of the Victorian Royal Commission on Vegetable Products [p. 477-490]. Colonel Warren reports from San Francisco, that branchlets of Eucalypts will drive mosquitos and other insects out of rooms.

Eucalyptus gomphocephala, De Candolle.*

The Tooart of South-Western Australia; attains a height of 120 feet, the clear trunk a length of 50 feet. The wood is tough, heavy and rigid, the texture close and the grain so twisted, as to make it difficult to cleave. It shrinks but little, does not split while undergoing the process of seasoning, and is altogether remarkably free from defects. It will bear exposure to all vicissitudes of weather for a long time, and is particularly valuable for large scantling, where great strength is needed; in ship-building it is used for beams, keelsons, stern-posts, engine-bearers and other work below the floatation; recommendable also for supports of bridges, framing of dock-gates and for wheelwrights' work; indeed it is one of the strongest woods known, whether tried transversly or otherwise [Laslett]. Grew in seven years to a good-sized tree in South-France, and so did the following species, as well as E. diversicolor, E. botryoides, E. Gunnii, E. polyanthema and E. viminalis [Naudin]. This species, as well as E. odorata, E. fœcunda and E. decipiens, thrive best in limestone-soil.

Eucalyptus goniocalyx, F. v. Mueller.*

Generally known as Bastard-Boxtree and occasionally as Spotted Gumtree. From Cape Otway to the Southern parts of New South Wales, rare near St. Vincent's Gulf [McEwin] and Flinders Range [J. E. Brown]. Ascends to 4,000 feet, and attains exceptionally a height of 300 feet. Thrives well near the city of Algiers [Professor Bourlier]. Should be included among those for Eucalyptus-plantations. Its wood resembles in many respects that of E. globulus, and is comparatively speaking easily worked. For house-building, fence-rails and similar purposes it is extensively

employed in those forest-districts, where it is abundant, and has proved a valuable timber It is especially esteemed for wheelwrights' work [Falck]. Excellent for fuel. Our local experiments showed the strength greater than that of E. amygdalina and E. obliqua, but less than that of E. globulus. Meltitose is formed occasionally on this tree and also on the following species. In this species and others the author counted more than one annual wood-ring without clearly visible demarcation of yearly increment.

Eucalyptus Gunnii, J. Hooker.*

Known as Swamp-Gumtree, the mountain variety as Cider-tree. Victoria, Tasmania and New South Wales, ascending alpine elevations. In the low-land along fertile valleys it attains a considerable size, and supplies a strong useful timber. It is this species, which survived severe frosts at Kew-Gardens. Bees obtain unusually much honey from the flowers of this species. Cattle and sheep browse on the foliage. Timber found to be almost equal in strength to that of E. macrorrhyncha, E. rostrata and E. globulus. The other very hardy Eucalypts comprise E. pauciflora, E. alpina, E. urnigera, E. coccifera and E. vernicosa, which all reach heights, covered with snow for several months in the year. Succeeded well at Arran [Capt. Brown and Rev. D. Landsborough]. The percentage of kino-tannin in the absolutely dry bark is from $9\frac{1}{2}$ to $11\frac{1}{2}$ [J. H. Maiden]. Any cutting down of healthy Eucalypts in places of centres of populations, to substitute there for a zone of evergreen vegetation the northern deciduous trees extensively, is regretable, as therewith the far superior hygienic value of the Eucalypts is lost, and the aspect of the Australian landscape during half a year rendered dismal, so far as vegetative features are concerned.

Eucalyptus hæmastoma, Smith.

One of the White Gumtrees of New South Wales and Southern Queensland, abundant in many localities. This species attains a very considerable size, but furnishes fencing and rough building material only and fuel of inferior quality [Rev. Dr. Woolls], yet it claims our attention particularly as fit for culture on sandy land, for which purpose very few other Eucalypts are suited, thus affording shelter and aiding salubrity. A variety occurs with persistent stringy bark. Dr. Bancroft finds the yield of kino from the stem and that of oil from the foliage considerable. Mr. Maiden determined the tannin in this kino to be about 54 per cent.; the kino is soluble as well in water as in alcohol.

Eucalyptus hemiphloia, F. v. Mueller.*

South-Eastern Australia, particularly inland. A tree, reaching 90 feet in height and 4 feet in stem-diameter. Trunk generally not tall. Regarded as a timber-tree of great excellence. It is

famous for the hardness and toughness of its timber, which is used for railway-sleepers, telegraph-poles, shafts, spokes, mauls, plough-beams and similar utensils. This passes at its places of growth as a "Boxtree" and a variety of it as "White Boxtree."

Eucalyptus Howittiana, F. v. Mueller.*

Littoral North-Queensland. A tree, gaining a height of fully 100 feet, with remarkably umbrageous foliage; girth of stem towards the base to fully 12 feet. Wood comparable to that of the so-called "Box-trees," but straighter in grain. This species would be particularly adapted for intra-tropical countries.

Eucalyptus largiflorens, F. v. Mueller.

South-Eastern Australia, principally in the inland-districts. One of the so-called Boxtrees, rising to a height of 120 feet as a maximum. Stem-diameter to 3 feet. Wood dark brown-red, excessively hard: fence-posts from this wood were found quite sound after 30 years.

Eucalyptus leptophleba, F. v. Mueller.

Queensland. Height rarely over 60 feet; stem-diameter to 3 feet. Timber strong, hard, very durable and variously applied, thus: for bridge-structures, mine-props and fence-posts; nearly always stipulated in contracts, at places of growth, for buildings [Stephen Johnson]. One of the most eligible species for intra-tropic culture. Allied to E. crebra.

Eucalyptus Leucoxylon, F. v. Mueller.*

The ordinary Ironbark-tree of Victoria and some parts of South Australia and New South Wales. It attains a height of 100 feet, and supplies a most valuable timber; this shows great strength and hardness, is much prized for its durability, is largely employed by wagon-builders for wheels and poles, by ship-builders for top-sides, tree-nails, the rudder (stock), belaying-pins and other purposes; it is also used by turners for rough work; it proved to be the strongest of all the woods hitherto subjected to test by Mr. Luehmann and myself, bearing nearly twice the strain of American oak and ash, and excelling even hickory by about 18 per cent. It is much recommended for railway-sleepers, and extensively used in underground mining work. The Railway-Commissioners of Victoria recently reported sleepers, laid 24 years ago, still quite sound. It is likewise very extensively employed for the handles of axes and other implements by Victorian manufacturers. The price of the timber in the log is about 2s. 5d. per cubic foot in Melbourne; the weight of such, when completely dried, varying from 63½ to 68½ lbs., equal to specific gravity 1·024—1·106 [F. v. Mueller and Rummel]. As it is for some purposes superior to that of almost any other Eucalyptus, the regular culture of this tree over wide areas should be fostered, especially as it can be raised on stony

ridges not readily available for ordinary husbandry. The wood is sometimes pale, in other localities rather dark. The tree is generally restricted to the lower Silurian sandstone- and slate-formation with ironstone and quartz. Nevertheless, it accommodates itself to various geologic formations, thus even to limestone-ground. The bark is remarkably rich in kino-tannin, yielding as much as 22 per cent. in the fresh state, but much less after drying; the fresh leaves contain about 5 per cent. and the dried leaves 9 to 10 per cent. This kino-tannin is not equal in value to mimosa-tannic acid from Acacia-bark, but it is useful as a subsidiary admixture, when light-coloured leather is not aimed at. As an astringent drug this kino is not without importance. Mr. Maiden found it to contain 42 per cent. tannin. The flowers are sought by bees, even more eagerly than those of most other Eucalypts, the resulting honey being excellent [Coleman]. E. Leucoxylon has, next to E. rostrata, thriven best about Lucknow, in India, among the species, tried there for forest-culture. E. Sideroxylon is a synonym, referring particularly to the rough-barked variety. For quickly withdrawing the sap from freshly felled timber in Switzerland the Rieser-process was invented; it consists in the wood being at once steamed and then kiln-dried, losses in timber through cracking or deterioration through warping being thus avoided. Mr. R. A. Robertson, in Victoria, has availed himself already of the patent. Eucalyptus-wood can in this way be used for casks, tools and other purposes far more advantageously, and gets also better workable, though for underground applications perhaps too much of the preservative principle may get removed.

Eucalyptus longifolia, Link.*

Extra-tropic Eastern Australia. A tree, known as the Woolly Butt, under favorable circumstances reaching 200 feet in height, the stem attaining a great girth. Mr. J. Reader asserts, that there is not extant a more useful timber; it stands well in any situation. Weight of a cubic foot of absolutely dry wood about $68\frac{1}{2}$ lbs., equal to specific gravity 1·107 [F. v. Mueller and Rummel]. The tree thrives well at the city of Algiers [Prof. Bourlier].

Eucalyptus loxophleba, Bentham.*

The York-Gumtree of extra-tropic West-Australia. Attains a height of about 100 feet, the stem a diameter of four feet. The wood is very tough, and preferably sought in West-Australia for naves and felloes. Even when dry it is heavier than water. This species passes into the earlier known E. fœcunda (Endlicher).

Eucalyptus macrorrhyncha, F. v. Mueller.*

The common Stringybark-tree of Victoria, not extending far into New South Wales. This tree attains a height of 120 feet, and is generally found growing on sterile ridges; to some degree frost-bearing. The wood, which contains a good deal of kino is used for

joists, keels of boats, fence-rails and rough building-purposes, also extensively for fuel. The fibrous dark-brown bark serves for roofs of huts and also for rough tying. The wood proved in our experiments here nearly as strong as that of E. globulus and E. rostrata, and considerably stronger than that of E. obliqua. The fresh bark contains from 11 to 14 per cent. of pure kino-tannic acid [F. v. M. and Rummel]. The kino contains about 72 per cent. of tannin. It is soluble in water as well as in alcohol [Maiden].

Eucalyptus, maculata, Hooker.*

The Spotted Gumtree of New South Wales and Queensland. A tree, reaching 150 feet in height. Grows best on stony ridges. The kino of this species is quite resinous, so much so, that articles varnished with it withstand the application of watery fluids [A. R. Crawford]. The wood is principally employed in ship-building, wheelwrights' and coopers' work. The heart-wood is as strong as that of British oak [Rev. Dr. Woolls]. Average specific gravity, when well-seasoned 0·942 [Clem. Hodgkinson]. Content with poor soil, but more susceptible to frost than many other congeners [Naudin]. Thrives well on the mountains of Ceylon and also at Algiers.

Eucalyptus marginata, Smith.*

The Jarrah or Mahogany-tree of South-Western Australia, famed for its indestructible wood, which is neither attacked by chelura, nor teredo, nor termites, and therefore much sought for jetties and other structures exposed to sea-water, also for any underground-work, telegraph-poles, and largely exported for rail-way-sleepers. Vessels built of this timber have been enabled to do away with copper-plating. For jetties the piles are used round, and they do not split when rammed even into limestone or other hard foundations, provided the timber is of the best hard kind [Walker and Swan]. The Government's Clerk of Works at Perth observed, that he took up piles in 1877, which were driven for a whaling jetty in 1834, and that the timber was perfectly sound, although the place was swarming with teredo. At the jetty in Freemantle, piles thirty years old and others one year old could scarcely be distinguished. The durability of this timber seems largely attributable to Kino-red, allied to phlobaphen, of which it contains about 15 to 17 per cent. Of kino-tannin it contains 4 to 5 per cent. Sir Fred. Abel traces the immunity of this timber against boring animals to the peculiar acid principle, contained in this and some allied woods. Timber of a close grain and a slightly oily and resinous nature; it works well, makes a fine finish, and is by local ship-builders considered superior to either sâl, teak or any other wood, except perhaps English oak or live-oak. In West-Australia it is much used for flooring, rafters, shingles; also for furniture, as it is easily worked, takes a good polish, and then looks

very beautiful. It is not too hard, and hence is more easily worked than E. redunca and E. loxophleba. The wood from the hills is darker, tougher and heavier than that from the plains. Well seasoned timber weighs about 64 lbs. per cubic foot; freshly cut, from 71 to 76 lbs. It is one of the least inflammable woods according to Captain Fawcett, and is locally regarded as one of the best woods for charcoal Mr. H. E. Victor, C.E., of Perth, estimates the area, covered at present by marketable Jarrah in South-Western Australia, at nine million acres, and the yield at an average about 500 cubic feet of good timber per acre, The trees should be felled in autumn or towards the end of summer, in which case the timber will not warp. The tree grows chiefly on ironstone-ranges. At Melbourne it is not quick of growth, if compared to E. globulus or to E. obliqua, but it is likely to grow with celerity in mountain-regions. It succeeds well on the mountains of Ceylon [Alexander]. Massed in its native country it presents the features of the East-Australian stringybark-forests. Stems of this tree have been measured 80 feet to the first branch, and 32 feet in circumference at 5 feet from the ground. Instances are even on record of the stem having attained a girth of 60 feet at 6 feet from the ground, through the formation of buttresses. To prevent rending of the sawn-timber, Mr. Simpson recommends it to be covered up with saw-dust.

Eucalyptus melanophloia, F. v. Mueller.

The Silver-leaved Ironbark-tree of New South Wales and Queensland. A middle-sized tree with a deeply furrowed bark and mealy whitish foliage. The timber is strong and durable, and used for telegraph-poles and railway-sleepers; it is however apt to rend, when exposed to the sun, unless well seasoned. Mr. Cosmo Newbery obtained from the bark 9 to 10 per cent. tannin.

Eucalyptus melliodora, A. Cunningham.*

The Yellow Boxtree of Victoria and some parts of New South Wales; of a spreading habit of growth, attaining a height of about 120 feet, with a comparatively stout stem. The wood resembles that of E. rostrata in texture, but is of a paler color, and not quite so durable; it is fully as strong, though second to that of E. Leucoxylon, E. siderophloia, E. polyanthema and the best E. globulus; it is esteemed for wheelwrights' and other artisans' work, in shipbuilding, and supplies excellent fuel. Weight of a cubic foot of absolutely dried wood between 67 and 70 lbs., equal to specific gravity 1·081-1·125 [F. v. M. and Rummel]. The young trees are used for telegraph-poles. Flowers much sought by bees, as they are particularly melligerous.

Eucalyptus microcorys, F. v. Mueller.*

One of the Stringybark-trees of New South Wales and South-Queensland, mostly known as Tallow-wood by the colonists. It

attains a great size; barrel up to 100 feet in length and to 7 feet in diameter. The whole height is sometimes nearly 300 feet [Fawcett]. According to Mr. Clement Hodgkinson it is probably the third in height among the Eucalypts, E. amygdalina and E. diversicolor being first and second, but perhaps E. obliqua, E. Raveretiana, E. pilularis, E. goniocalyx and particularly E. globulus get as high, the latter reaching occasionally 330 feet as recorded by Mr. Backhouse. The wood is yellowish, free from kino-particles, easily worked by saw or plane; it is of a very greasy nature, so much so as to be quite slippery when first cut [Ch. Fawcett]. This oily substance, very similar to viscin, of which it contains about 1 per cent., prevents the wood from splitting and twisting, though not from shrinking. The timber is hard and durable also underground, and is employed for railway-sleepers, wheelwrights' work, for knees and breast-hooks in ship-building; the young trees serve for telegraph-poles. The foliage is remarkably rich in volatile oil. The kino differs from that of other Stringybark-trees in being soluble only in warm water and in hot alcohol; it contains catechu [J. H. Maiden]. Dr. Dymock records the astonishing fact, that in some parts of India this tree grew 30 feet in two years [Dr. Bancroft]. This species did particularly well at George-town in British Guiana, growing at a rate from 10 to 18 feet in a year while in a young state [Jenman]. It proved also valuable for the mountains of Ceylon, where it grew 64 inches in girth in 8 years [Alexander].

Eucalyptus microtheca, F. v. Mueller.

Widely dispersed over the most arid extra-tropical as well as tropical inland-regions of Australia. Withstands unscorched a frequent heat of 156° F. in Central Australia, yet neither affected by exceptionally severe frosts (18° F.) in the South of France, when many other Eucalypts suffered. The development of this species in Southern France and Algeria has been marvellously quick [Prof. Naudin]. One of the best trees for desert-tracts; in favorable places 150 feet high. Wood brown, sometimes very dark, hard, heavy and elastic; it is prettily marked, hence used for cabinet-work, but more particularly for piles, bridges and railway-sleepers [Rev. Dr. Woolls].

Eucalyptus miniata, Cunningham.

Litoral North-Western Australia. Attains a height of 80 feet. Likes somewhat ferruginous soil [M. Holtze]. The brilliancy of its orange-colored flowers can hardly be surpassed. Yields kino of a reddish color.

Eucalyptus Muelleriana, Howitt.

Gippsland, on sandy clay. Yellow Stringybark tree. Maximum height 170 feet, with a straight rather massive bole. The wood is dark, fissile, free from kino-veins or shakes, clear in the grain and very durable, used for splitting and sawing. Fence-posts of this timber have lasted for more than 30 years [A. W. Howitt].

Eucalyptus obliqua, L'Héritier.*

The ordinary Stringybark-tree of Tasmania, generally designated Messmate-tree in Victoria, attaining a height of 300 feet, with a stem more than 10 feet in diameter, growing mostly in mountainous country and content with poor dry soil. The most gregarious of all Eucalypts from Spencer's Gulf to the southern parts of New South Wales, and in several varieties designated by splitters and other wood-workers by different names. Most extensively used for cheap fencing rails, palings, shingles and any other rough woodwork, not when great strength or elasticity is required. The bulk of wood obtained from this tree in very poor soil is perhaps larger than that of any other kind, and thus this species can be included even in its native country, where it is naturally common and easily re-disseminated, among the trees for new forest-plantations in barren woodless tracts, with a view of obtaining a ready and early supply of cheap and easily fissile wood. Main-root more straightly descending than that of most other species. Weight of completely dry wood from $50\frac{1}{2}$ to $61\frac{1}{2}$ lbs. per cubic foot, equal to specific gravity 0·808 to 0·984. The young trees are sometimes used for telegraph-poles. The fresh bark contains from 11 to $13\frac{1}{2}$ per cent. kino-tannic acid; the dry leaves, according to Mr. Maiden, produce about 17 per cent.

Eucalyptus ochrophloia, F. v. Mueller.

Arid interior of sub-tropic Eastern Australia, on ground subject to occasional floods. A tree seldom over 30 feet high. Wood tough, serviceable for slabs, rails and rafters, but not lasting underground. A tree recommendable for hot and dry regions.

Eucalyptus odorata, Behr.

The Peppermint-tree of South-Australia. Reaching 70 feet in height, the stem $2\frac{1}{2}$ feet in diameter. Timber hard, very durable, used for sleepers, posts and piles [J. E. Brown]. The tree follows the limestone-formation, but occurs also in clayey loam; 1,000 lbs. of foliage gave 112 oz. of oil [Nitschke].

Eucalyptus oleosa, F. v. Mueller.

One of the smaller Eucalypts, known as Mallee, extending from East- to West-Australia through the desert-regions. The essential oil, in which the foliage of this species is comparatively rich, dissolves india-rubber without heat, according to Mr. Bosisto; it is also one of the best solvents for amber and other fossil resins. It is largely produced at the Wimmera by Mr. Bosisto; it is unusually rich in Eucalyptol and thus leadingly indicated for antiseptic purposes; it contains also a principle allied to Cumin-Aldehyd; it does not cause, through irritating particles, any cough to patients inhaling it [Schimmel]. The variety longirostris attains a height of 120 feet, with a stem of 70 feet without a

branch, in West-Australia, where it is vernacularly known as Morrell. The wood is remarkably hard, splits freely, and is used for spars, rafters, fence-rails. wheelwrights' work and agricultural implements. Is is of a red tinge, and sinks in water, even when dry. 1,000 lbs. of fresh foliage gave, in distillation, 62 oz. of oil [Nitschke]. Of other Mallees E. gracilis gave 54 oz.; E. uncinata, 69 oz.; E. incrassata, 112 oz. At Mr. Bosisto's great factory in the mallee-scrub, where all four species are mixedly used, 30 tons of foliage come into distillation every week for 10 months in the year, the development of oil during autumn considerably diminishing. The average yield is about 1 per cent.

Eucalyptus paniculata, Smith.

The Red Ironbark-tree of New South Wales. This species has particularly well thriven in the coast tracts of Natal. [J. M. Wood]; it furnishes a hard durable wood, excellent for railway sleepers. It is also much used for building and fencing, as it is lasting underground. All the trees of this series are deserving of cultivation, as their wood, though always excellent, is far from alike, and that of each species preferred for special purposes of the artisan. A variety from the deserts is so marked, that it received the name E. fasciculosa, and may for xylologic distinctions be very well kept apart.

Eucalyptus patens, Bentham.

The "Black-butt" of South-Western Australia. Attains a height of 120 feet, and a stem-diameter of 6 feet. The timber is so tough as not to yield to ordinary splitting processes, therefore useful for various wheelwrights' work; it has proved also durable underground.

Eucalyptus pauciflora, Sieber. (*E. coriacea,* A. Cunningham.)

Vernacularly known as White gumtree, Drooping gumtree or Swamp-gumtree. New South Wales, Victoria, Tasmania. A tree of handsome appearance, with a smooth white bark and generally drooping foliage; it attains considerable dimensions, grows best in moist ground, ascends to alpine elevations, and thus is one of the hardiest of all its congeners. Even small seedlings are not injured by the winters of Arran: grew there 20 feet in seven years [Rev. D. Landsborough]. It shows a preference for basaltic soil. Horses, cattle and sheep browse readily on the foliage. It is locally a "stand-by" in bad pastoral seasons. Its timber is used for ordinary building and fencing purposes. For quickly producing fuel one of the best of trees [A. R. Crawford]. Also a rich yielder of Kino, which is soluble in water as well as in alcohol.

Eucalyptus phœnicea, F. v. Mueller.

Carpentaria and Arnhem's Land. Of the quality of the timber hardly anything is known, but the brilliancy of its scarlet flowers recommends this species for a place in any park-plantation of countries with a serene clime.

Eucalyptus pilularis, Smith.*

The Black-butt of South-Queensland, New South Wales and Gippsland. One of the best timber-yielding trees about Sydney; of rather rapid growth [Rev. Dr. Woolls]. Exceptionally rising to 300 feet. At Bulli a stem expanded by buttresses to 57 feet girth at the base; the stem measured 40 feet in circumference at 6 feet from the ground. More branching out when young than many other species, and thus fitter for storm-exposed localities [H. L. Holmes]. Timber much used for flooring-boards, also for railway-sleepers and telegraph-poles. Weight of a cubic foot of absolutely dry wood from 50 to 56 lbs., equal to specific gravity 0·803-0·897 [F. v. M. and Rummel]. The kino of this tree is soluble as well in water as in alcohol [J. H. Maiden].

Eucalyptus piperita, Smith.

New South Wales and Gippsland, often termed White Stringybark-tree. It grows to a considerable height, and its stem attains a diameter of four feet. The wood is fissile, and used for the same purposes as that of other Stringybark-trees. The Kino is soluble in water as well as in alcohol. The foliage is rich in volatile oil, and yields also, according to Mr. J. H. Maiden, a comparatively large percentage of kino-tannin, about 12½ per cent. from perfectly dried leaves. All Eucalypts with strong-scented foliage are useful as insecticides; the fresh leaves also purify the air of unsalubrious dwellings and of hospitals. Thus the foliage is also very inflammable, and this has to be kept in mind when establishing Eucalyptus-forests.

Eucalyptus Planchoniana, F. v. Mueller.

South-Queensland and Northern part of New South Wales. A tree to about 100 feet in height, the stem reaching 3 feet in diameter. The foliage is dense. Timber sound, heavy, hard and durable, well adapted for sawing, but not easy to split [Bailey].

Eucalyptus platyphylla, F. v. Mueller.

Queensland. Regarded by the Rev. Julian Tenison-Woods as one of the best of shade-trees, and seen by him to produce leaves sometimes 1½ feet long and 1 foot wide. This tree is available for open exposed localities, where many kinds of trees from deep forest-valleys would not thrive. It is closely allied to E. alba from Timor. The timber is curly and durable.

Eucalyptus polyanthema, Schauer.*

South-Eastern Australia. Generally known as Red Boxtree A tree, attaining a height of 150 feet; it furnishes an extremely hard and lasting timber, in great demand for mining purposes and rail way-sleepers, also for wheelwrights' work, For fuel this wood is unsurpassed. It is extremely strong, excelling oak and ash, surpassed among Eucalypts in transverse strength, according to our

experiments, only by E. Leucoxylon and E. siderophloia. A variety of this tree, passing as Slaty Gumtree, is much lauded by the Rev. Dr. Woolls on account of the value of its timber. Thrives well around the city of Algiers [Prof. Bourlier].

Eucalyptus populifolia, Hooker.

The "Bembil" or Shining-leaved Box-Eucalyptus. Dry inland-portions of Eastern Australia. Height not above 50 feet; but stem-diameter to 3 feet. Leaves deciduous for a short time in the year. Likes humid underground. Wood used for posts, hand-spikes, levers and other articles needing toughness; proved to be very durable [Bailey].

Eucalyptus punctata, De Candolle.*

The Leatherjacket-or Hickory-Eucalypt of New South Wales. A beautiful tree, attaining a height of 100 feet or more, of rather quick growth, thriving even in poor soil. The wood is of a light-brown color, hard, tough and very durable; used for fence-posts, railway-sleepers, wheelwrights' work, also for ship-building [Woolls].

Eucalyptus Raveretiana, F. v. Mueller.*

Vernacularly known as Grey or Iron-Gumtree. Queensland. A tree of the largest size, attaining a height of 300 feet and a stem-diameter of 10 feet; delights in the immediate vicinity of rivers or swamps. More susceptible to frost than many other species. [Naudin]. It furnishes a very hard, durable, dark-colored wood, valuable for piles, railway-sleepers and general building purposes [Thozet, O'Shanesy, Bowman]. From cuts into tho stem an acidulous almost colorless liquid exudes, available in considerable quantity, like that of E. Gunnii. Mr. J. S. Edgar pronounces this the best species for shade in Eastern subtropic-Australia. Prof. Naudin notes it as of particularly quick growth in South-France and North-Africa.

Eucalyptus redunca, Schauer.*

The White Gumtree of Western Australia, the Wandoo of the aborigines. Attains very large dimensions; stems have been found with a diameter of 17 feet. The bark is whitish, but not shining, imparting a white coloration when rubbed [Sir J. Forrest]. The tree is content with cold flats of comparatively poor soil, even where humidity stagnates during the wet season. It furnishes a pale, hard, tough, heavy and durable wood, highly prized for all kinds of wheelwrights' work, and especially supplying the best felloes in West-Australia. The seasoned timber weighs about 70 lbs. per cubic foot.

Eucalyptus resinifera, Smith.*

The Red Mahogany-Eucalypt of South-Queensland and New South Wales. A superior timber-tree, of large size. Wood much prized for its strength and durability [Rev. Dr. Woolls]. This Eucalyptus has proved one of the best adapted for a tropical clime; it grew 45 feet in ten years at Lucknow, but in the best soil it has attained 12 feet in two years [Dr. Bonavia]. Does well at the city of Algiers [Prof. Bourlier]. Proved in Italy nearly as hardy as E. amygdalina and E. viminalis, according to Prince Troubetzkoy, but is often confounded with E. siderophloia. A large-leaved variety extends far into the tropics.

Eucalyptus robusta, Smith.*

New South Wales and Southern Queensland, where it is known as Swamp-Mahogany. It attains a height of 100 feet and a stem-girth of 12 feet, bearing a really grand mass of foliage. Resists cyclones better than most of its congeners. The wood is remarkably durable, reckoned a fairly good timber for joists, also used for ship-building, wheelwrights' work and many implements, for instance such as mallets. The tree seems to thrive well in low, sour, swampy ground near the sea-coast, where other Eucalypts look sickly, but E. robusta the picture of health [W. Kirton]. It is this species, which with E. citriodora has thriven so particularly well in the drier parts of Mauritius [C. van Keirsbilck]; succeeded also well at the city of Algiers [Bourlier]. Leaves perfectly dried yielded 12 per cent. of kino-tannic acid [Maiden].

Eucalyptus rostrata, Schlechtendal.*

The Red Gumtree of Southern Australia and many river-flats in the interior of the Australian continent, nearly always found on moist ground with a clayey subsoil, and with most Eucalypts comparatively cattle- and sheep-proof. It will thrive in ground, periodically inundated for a considerable time, and even in slightly saline places. Attains exceptionally a height of 200 feet with a comparatively slight stem, but is mostly of a more spreading habit of growth than the majority of its tall congeners. Prof. Tate measured a tree on Mount Lofty, which showed a stem-girth of 25 feet. Mr. R. G. Drysdale of the Riverina-district observed, that an exceptional temperature of 125° F. in the shade did not shrivel the foliage of this tree; it has also withstood the severest heat in Algeria better than E. globulus; and Dr. Bonavia found it to thrive well in the province of Oude in places, where E. globulus, E. obliqua and E. marginata perished under the extreme vicissitudes of the clime; succeeds also well on the mountains of Ceylon. It does not bear cold so well as E. amygdalina, succumbing when still young at a temperature below 23° F., as observed in Italy by Prince Troubetzkoy. In Mauritius and Réunion it resisted the hurricanes better than any other Eucalypt; in the latter island the Marquis

de Chateauvieux observed it to grow 65 feet in six years, and it is always of a more rapid growth than E. marginata, but less so than E. globulus. It grew also with remarkable rapidity in British Guiana [Jenman]. It is recommended as an antiseptic tree for cemeteries in mild climes. The timber is one of the most highly esteemed in all Australia among that of Eucalypts, being heavy, hard, strong and extremely durable, either above or under ground or in water. For these reasons it is very much prized for fence-posts, piles and railway-sleepers. For the latter purpose it will last at least a dozen years, but if well selected much longer. Indeed Mr. Speight reports, that sleepers were found quite sound after being 24 years in use. It is also extensively employed by ship-builders for main-stem, stern-post, inner-post, dead-wood, floor-timbers, futtocks, transoms, knighthead, hawse-pieces, cant-, stern-, quarter- and fashion-timbers, bottom-planks, breast-hooks and riders, windlass and bow rails. It should be steamed before it is worked for planking. Also largely used for felloes, buffers and posts and any parts of structures, which come in contact with the ground; not surpassed in endurance for woodbricks in street paving and for tramways. It would be quite remunerative to rear on land too poor for ordinary crops in the mild zones this and other Eucalypts with durable timber for wood-paving blocks, even for export to colder countries, especially at not too remote distances. Next to the Jarrah from West-Australia this is the best Eucalyptus-wood for resisting the attacks of the crustaceous chelura and limnoria, the teredo-mollusk and white ants, and it has the advantage of being considerably stronger, proving equal in many instances to American white oak. Weight of a cubic foot of absolutely dry wood, from $53\frac{1}{2}$ to $57\frac{1}{2}$ lbs., equal to specific gravity 0·858-0·932 [F. v. M. and Rummel]. According to experiments by Mr. Luehmann and myself, it is surpassed in resistance to transverse strain by E. melliodora, E. polyanthema and particularly E. siderophloia and E. Leucoxylon, though stronger than the wood of many other of its congeners. Honey mainly from the flowers of this tree proved of good quality. The kino of E. rostrata is far less soluble in cold water than that of E. calophylla, and is used as an important medicinal astringent. For further details of the uses of this and other Eucalyptus-trees, refer to the reports of the Victorian Exhibitions of 1862 and 1867, also to the ten Decades of the Eucalypto-graphia. E. rostrata has become already spontaneous disseminated in Southern France, according to Prof. Ch. Naudin, whose important "Mémoire sur les Eucalyptus 1883" should also be consulted regarding the characteristics, development, hardiness and uses of Eucalypts. A great number of Red Gum-trees in Gippsland are killed by the larvæ of a nocturnal lepidopterous insect, identified by Sir Fred. McCoy as Urubra lugens. They eat away the epidermis of the leaves on both sides, thus asphyxiating the tree [A. W. Howitt]. It seems that other insects affect also injuriously various Eucalypts in a similar manner.

Eucalyptus saligna, Smith.

Eastern extra-tropic Australia. Stems clear up to 100 feet occur with basal girth of 26 feet. The wood, employed for rails, will last a life-time. Hardier than E. globulus [A. R. Crawford]. According to the Rev. Dr. Woolls the wood is of excellent quality, and largely used for building purposes. The tree is generally found on rich soil along river-banks.

Eucalyptus salmonophloia, F. v. Mueller.

The Salmon-barked Gumtree of South-Western Australia, attaining a height of 120 feet. The timber is good for fencing, while the foliage is available for profitable oil-distillation. The shining mixedly whitish and purplish bark does not give off a white coloration like that of E. redunca.

Eucalyptus salubris, F. v. Mueller.

The Gimletwood or Fluted Gumtree of Western and Central Australia, living on poor dry soil and in the hottest desert-clime. It is generally a slender-stemmed tree, sometimes to 100 feet high and to 2 feet in stem-diameter, with scanty foliage. The bark is shining with a brownish tinge, and has broad longitudinal and often twisted impressions, or roundish blunt longitudinal ridges. The wood is hard and tough, but worked with comparative ease, heavier than water, even when dry. It serves locally for roof-supports, fence-posts and rails, poles and shafts. For xylography it seems better than Pear-tree wood, and deserves attention for this purpose. The tree exudes kino.

Eucalyptus siderophloia, Bentham.*

The Large-leaved or White or Grey Ironbark-tree of New South Wales and South-Queensland, attaining a height of 150 feet. According to the Rev. Dr. Woolls this furnishes one of the strongest and most durable timbers of New South Wales; with great advantage used for railway-sleepers, jetty-piles and for many building purposes. It is likewise highly appreciated by wheelwrights, especially for spokes, also well adapted for tool-handles and various implements. Found by us to be even stronger than hickory, and only rivalled by E. Leucoxylon. It is still harder than the wood of E. Leucoxylon, but for this reason worked with more difficulty. Well seasoned it is slightly heavier than water. The Melbourne price of the timber is about 2s. 6d. per cubic foot in the log. The tree yields much kino. Mr. Newbery obtained from the bark 8 to 10 per cent. tannin. This species is often confounded with E. resinifera in culture.

Eucalyptus Sieberiana, F. v. Mueller.* (*E. virgata,* Bentham not Sieber.)

South-Eastern Australia. Vernacularly known as Mountain-ash in Gippsland and New South Wales, and as Ironbark-tree or Gumtop in Tasmania. In Gippsland it ascends to an altitude of 4500 feet [A. W. Howitt]. A straight-stemmed tree, quickly growing, reaching 150 feet in height and five feet in stem-diameter. The wood is of excellent quality, strong and elastic, hence used for ship- and boat-building, implement-handles, staves of casks, cart-shafts, swingle-trees, also for fencing and for general building purposes. It splits freely and smoothly, and is easy to work. It burns well, even when freshly cut. The kino is soluble in water as well as in alcohol [J. H. Maiden]. Systematically the species is very closely allied to E. hæmastoma, but much superior as a timber-tree. Bears seeds already when quite young. Has done well in the cool clime of the South of New Zealand [Th. Waugh].

Eucalyptus Staigeriana, F. v. Mueller.*

The Lemon-scented Ironbark-tree. North-Queensland. A rather small tree, allied to E. crebra. Wood reddish, twisted, durable. Produces readily new shoots from the root [G. Wycliffe]. Foliage delightfully fragrant, therefore available for the distillation of a superior cosmetic oil, reminding in odor of that of Lippia, Andropogon and Bergamotte, less of Lemon; the perfume and flavour are so excellent as to render this oil eligible for table-condiments; Mr. K. Staiger found the yield from dry leaves to be $2\frac{3}{4}$ per cent. Mr. F. M. Bailey drew first public attention to this fine tree.

Eucalyptus stellulata, Sieber.

The Sallee. South-Eastern Australia. Bears considerable frost, but becomes never a very tall tree. Not adapted for a hot clime.

Eucalyptus Stuartiana, F. v. Mueller.

South-Eastern Australia. Known to the colonists as apple-scented Gumtree. A medium-sized tree, with fibrous bark and drooping branches; foliage copious. Occurs on rather dry and sandy as well as on humid soil. The wood is mostly used for fencing and for fuel. According to our own observations here it is of nearly the same strength as that of E. rostrata and E. globulus, and somewhat stronger than that of E. amygdalina and particularly E. obliqua. This is one of the hardiest species, as first ascertained by Mr. T. Waugh.

Eucalyptus tereticornis, Smith.*

From Eastern-Queensland, where it is termed Red Gumtree, to Gippsland, attaining a height of 160 feet. Closely allied to E. rostrata. Will thrive on undrained ground. The timber is esteemed for the naves and felloes of wheels. For telegraph-poles and railway-sleepers it is inferior to some of the Ironbark-trees,

lasting a shorter time. Mr. A. R. Crawford observes, that he has never known posts of this wood decaying from dry rot, nor saw it as round posts ever attacked by the termites. Quite underground it remains sound much longer [Thozet]; but much depends, as regards its durability, on the locality where it is obtained, and the manner of drying, a remark which applies also to many other Eucalypts. Has prospered remarkably in the Punjab, attaining to a height of 60 feet in seven years [Major P. C. Napier].

Eucalyptus terminalis, F. v. Mueller.*

The Bloodwood-tree of the northern and central parts of Australia, closely allied to E. corymbosa, attaining a considerable size, thriving even in sandy desert-country. The wood is dark-red, hard and extremely tough, particularly fit for boards, as it does not crack. Locally used for piles, for foundation-blocks of buildings, as one of the best woods there [Th. Gulliver]. The tree resists the enormous desert-heat of Central Australia, where the shade temperature ranges from 27° to 122° F., and where the annual rainfall in some years is only 2 inches, and seldom more than 10 inches. Particularly adapted for dry tropical climes.

Eucalyptus tessellaris, F. v. Mueller*.

Central and Northern Australia and Queensland. The Moreton-bay-Ash. This tree reaches even on dry ridges a height of 150 feet, surpassing any other Central-Australian species in loftiness, and there resists the severe summer-heat [Rev. H. Kempe]. Furnishes a brown, rather elastic wood, not very hard, easily worked, of great strength and durability, available for many kinds of artisans' work, and particularly sought for staves and flooring. The tree exudes much astringent kino [P. O'Shanesy]. Several other species might yet be mentioned, particularly from tropical Australia, but we are not yet well enough acquainted with their technical value. All Eucalypts are eligible for the production of tar, pitch, acetic acid, wood-spirit, paper-material, potash and various dye-substances on a commercial scale.

Eucalyptus triantha, Link.* (*E. acmenoides,* Schauer.)

New South Wales and Eastern Queensland. Known as White Mahogany. It attains a considerable height, with a stem reaching 4 feet in diameter, and is of rapid growth. The wood is used in the same way as that of E. obliqua, but is superior to it. It is heavy, strong, durable, of a light color, and has been found good for palings, rails, flooring-boards, battens and many other purposes of house-carpentry [Rev. Dr. Woolls].

Eucalyptus urnigera, J. Hooker.

Cooler region of Tasmania only. Seldom attaining a great height, but in this work not to be passed, as it is one of the hardiest and most antiseptic of all Eucalypts. Botanically to be regarded as -

highly developed state of E. cordata (La Billardière), but horticulturally very distinct. Professor Balfour observes, that a tree of this species has stood thirty years in the open air at Haddington (South-Scotland), attaining a height of 50 feet with a stem 8 feet in circumference at the base. Stood the severest winters in York and Devon, when E. siderophloia, E. rostrata, E. rudis perished, and E. botryoides froze to the ground, but subsequently sent up strong shoots again [Dr. Masters). Shelter against hard cold winds is in these cases imperative [Rev. D. Lansborough]. Grew in the south of New Zealand to 20 feet in ten years [Th. Waugh].

Eucalyptus viminalis, La Billardière.

South-Eastern Australia. On poor soil only a moderate-sized tree, with a dark rough bark on the trunk, and generally known as Manna-Gumtree; in rich soil of the mountain-forests it attains however gigantic dimensions, rising to a height of rather more than 300 feet, with a stem occasionally to 15 feet in diameter. It has there a cream-colored smooth bark, and is locally known as White Gumtree. Hardy at Arran [Capt. Brown]. The timber is light-colored, clear, and though not so strong and durable as that of many other kinds of Eucalypts, is very frequently employed for shingles, fence-rails and ordinary building purposes. It is stronger than that of E. amygdalina and E. obliqua. Weight of a cubic foot of absolutely dry wood about 43 lbs., equivalent to specific gravity 0·685. The fresh bark contains about 5 per cent. kino-tannin. The only species, which yields the crumb-like melitose-manna copiously. The wood of this, of E. globulus, E. melliodora and some others is occasionally bored by the larvæ of a large moth. Endoxyla Eucalypti, and also by two beetles, Phoracantha tricuspis and Hapatesus hirtus [C. French]. For fuller original information on Eucalypts consult particularly Woolls' "Contribution to the Knowledge of the Flora of Australia," and his lectures on the "Vegetable Kingdom," the volumes of the "Bulletin de la Société d'Acclimatation de France." For extensive information on the varied therapeutic properties of Eucalypts, refer to an article, partly by the writer of this volume, as contained in the "Sydney Medical Gazette of 1884" [Prof. Mosler].

Euchlæna luxurians, Ascherson.* (*Reana luxurians,* Durieu.)

The Teosinte. Guatemala, up to considerable elevations. Annual. Highly recommendable as a fodder-grass for regions free of frost. A large number of stems, sometimes as many as 90, spring from the same root, attaining a height of 18 feet. The leaves grow to lengths of 3 feet and form a good forage. The young shoots, when boiled, constitute a fair culinary esculent. Dr. Schweinfurth harvested at Cairo from three seeds in one year about 12,000 grains; the plant requires about ten months to ripen seeds from the time of sowing. Has grown 9 feet high as far south as Cambewarra

[Thos. Weir]. Best grown as green crop for stable-fodder; in cool regions requiring to be resown annually from fresh seeds, acquired from warm countries. This grass, particularly in its young state, is remarkably saccharine. For scenic growth this stately plant is also recommendable. Vilmorin estimates one plant sufficient for feeding two head of cattle during twenty-four hours. Mons. Thozet, at Rockhampton, obtained plants 12 feet high and 12 feet wide in damp alluvial soil, each with 32 main stalks bearing nearly 100 flower bunches. It is rather slower in growth than Maize, but lasting longer for green fodder, and not so hardy as Sorghum. It is essentially a summer-grass. Its growth can be continued by cutting the tufts as green fodder; thus tender food is continued; it does not cause colic to horses and cattle. As a forage-plant it is without a rival in warm climes. It can also be readily dried for hay. It likes humid soil best, and resists intense heat. It was first brought into notice by the Acclimatisation-Society of Paris, and introduced into Australia and Polynesia by the writer. In Fiji it is thriving most luxuriantly, forming, sown at 4 feet apart, impenetrable masses. Requires humidity to come to its greatest development. In tropical countries, when cut, it will renew its growth [R. Parkinson]. The Fiji-parrots prey on the seeds, and horses are fond of this grass for forage [Sir John Thurston]. Easily naturalized in tropical jungles to the particular delight of parrots, cockatoos and many other birds. Grain greedily picked up by fowls for food. On sugar-cane plantations of Queensland the horses preferred the Teosinte to young cane. After being cut for green feed, it "stools heavily and ratoons fast," and may be cut every two months for a heavy crop [Bauer]. Seeded also at the Great Bight [Brooks]. Plants raised on the Murray and Murrumbidgee produced over a hundred flower-stems [F. Rosan] to the height of 10 feet, with leaves to 2 feet in length and $2\frac{1}{2}$ inches in width [W. McGan]. In cooler climes the Teosinte might well serve for ensilage, or as a big summer-grass; it lives in sheltered places at Port Phillip. Each plant requires at least 16 square-feet of ground for its full development. Even in regions, where the seeds will not ripen, this huge grass should be annually resown on pastures overrun with noxious weeds, which would soon become suffocated. Fit for irrigation. Euchlæna Mexicana might also be tested.

Euclea myrtina, Burchell.

South-Africa. Berry small, black, edible. To us this plant would hardly be more than an ornamental bush.

Euclea Pseudebenus, E. Meyer.

Africa, down to extra-tropic regions. Yields the Orange-River Ebony.

Euclea undulata, Thunberg.

South-Africa. Berry small, red, edible. Other shrubby species from the same portion of the globe also yield esculent fruits, which under superior culture may vastly improve.

Eucryphia cordifolia, Cavanilles.

The Muermo or Ulmo of Chili. This magnificent evergreen tree attains a height of over 100 feet, producing a stem sometimes 6 feet in diameter. The flowers are much sought by bees. For oars and rudders the wood is preferred in Chili to any other [Dr. Philippi]. We possess congeneric trees in Tasmania (E. Billardièri, J. Hooker) and in New South Wales (E. Moorei, F. v. M.)

Eugenia Australis, Wendland. (*E. myrtifolia,* Sims not Roxburgh.)

East-Australia. A handsome bush with palatable fruit. Careful special culture would probably improve all Eugenia-fruits.

Eugenia caryophyllata, Thunberg. (*Caryophyllus aromaticus,* Linné).

Moluccas. The Cloves-tree. Here cursorily mentioned, although not strictly of any extra-tropic culture, but prospering as far South with us as Moreton-Bay [Fr. Turner].

Eugenia cordifolia, Wight.

Ceylon, up to 3,000 feet elevation. Fruit edible, of 1 inch diameter.

Eugenia Hallii, Berg.

Quito. Fruit of large size, edible.

Eugenia Jambolana, Lamarck.

Southern Asia, ascending to 5,000 feet in Kumaon, Polynesia, probably hardy in extra-tropic latitudes. The fruit of this handsome and finally tall tree is about cherry-size, purplish-black when ripe and edible; it may perhaps be improved by well directed skilful culture. Madame Van Nooten indeed in her splendid work on Java-plants pictures fruits over $1\frac{1}{2}$ inches long. The seeds have come into use as a remedy against diabetes [Christy].

Eugenia Jambos, Linné.

Continental and Insular India. A tree of middling size; its fruits known as Rose-Apples. Cultivated in Jamaica up to 4,000 feet [Fawcett]; hardy in the mildest regions of Victoria. The rosy-odorous fruit is best used as an admixture to various other dishes.

Eugenia maboides, Wight.

Ceylon, up to 7,000 feet elevation. Fruit of the size of a small cherry [Dr. Thwaites].

Eugenia Malaccensis, Linné.

The large Rose-Apple. India. A tree, attaining a height of 40 feet, but fruiting already as a shrub. Although strictly a tropical plant, it has been admitted into this list as likely adapted for warmer forest-regions in extra-tropic zones. The leaves are often a foot long. The large juicy fruits, of rosy odor, are wholesome and of agreeable taste. Of others E. macrocarpa (Roxburgh), E. Javanica (Lamarck), E. aquea (Burmann), E. amplexicaulis (Roxburgh), also from Lower India, likewise produce edible fruit of good size, and may perhaps endure a cool clime.

Eugenia Mhanica, Cambessedes.

South-Brazil. The berries, which are of the size of plums, are there a table-fruit.

Eugenia pyriformis, Cambessedes.

Uvalho do Campo of South-Brazil. Fruit of pear-size and edible.

Eugenia revoluta, Wight.

Ceylon, up to heights of 6,000 feet; berry 1 inch in diameter, edible.

Eugenia rotundifolia, Wight.

Ceylon, up to 8,000 feet; rejoicing therefore in a cool or even cold climate. The fruit of this and the allied E. calophylloides (Wight), which extends to Upper India, edible; so that of E. Arnottiana (Wight), which tree ascends to 7,000 feet.

Eugenia Smithii, Poiret.

From Gippsland to Queensland. A splendid large umbrageous tree, but not of quick growth, and requiring rich soil in river-valleys for its perfect development. The bark contains about 17 per cent tannin. This fact may give a clue to the recognition of the same tan-principle in the barks of numerous other species of the large genus Eugenia.

Eugenia supra-axillaris, Spring.

The Tata of South-Brazil. Fruit large, edible.

Eugenia Tierneyana, F. v. Mueller.

North-Eastern Australia. A tall tree. The red fruit is not large, but produced in good quantity and can be made into a palatable jam [Dallachy].

N

Eugenia uniflora, Linne. (*E. Michelii,* Lamarck.)

From extra-tropical South-America extending to the Antilles. A tree of beautiful habit, with edible fruit of cherry-size. Dr. Lorentz mentions also as a sub-tropical Argentine fruit-species *E. Mato* (Grisebach). Hieronymus adduces similarly E. ligustrina (Willdenow) and E. edulis (Bentham), the fruit of the latter species being of apple-size.

Eugenia Zeyheri, Harvey.

South-Africa. A tree attaining about 20 feet in height. The berries are of cherry-size and edible. The relative value of the fruits of many Asiatic, African and American species of Eugenia remains to be ascertained; many of them doubtless furnish also good timber, and all more or less essential oil. All such, even tropical trees, should be tested in warm tracts of the temperate zone, inasmuch as many of them endure a cooler clime, than is generally supposed.

Euonymus atropurpureus, Thunberg.

The "Waahoo" of Eastern North-America. A tall shrub, the bark of which is used in medicine, and from it the euonymin, an oleo-resin as a cholagogue is prepared. To this species is closely allied L. occidentalis (Nuttall) from Oregon and California.

Euonymus Japonicus, Thunberg.

Japan. This evergreen shrub can be used advantageously for forming hedges; it is easily multiplied by layers and requires little care in cultivation. The wood of several species of Euonymus affords superior coal for gunpowder.

Eupatorium purpureum, Linné.

Eastern North-America. "Queen of the Meadows." A perennial herb, easily naturalized; has come into medicinal use as a powerful diuretic; so also E. perfoliatum, L., the "Thoroughwort" or "Boneset"; these with other species are also not unimportant as honey-plants; so of the same order in N. America species of Actinomeris and Prenanthes.

Eupatorium tinctorium, Grisebach.

Paraguay. A shrub of remarkably prolific and vigorous growth [E. H. Egerton]. Competes almost with the indigo-plant for dye. It can be stripped of its leaves four times a year without injury to the plant.

Eupatorium triplinerve, Vahl. (*E. Ayapana,* Ventenat).

Central America. A perennial somewhat shrubby herb, possibly hardy in the warmer parts of extra-tropical countries. It contains eupatorin and much essential oil peculiar to the plant. It stands

locally in renown as a remedy against ophidian poisons, and evidently possesses important medicinal properties. A tanning extract is prepared for the English market from this herb, containing about 20 per cent. tannic acid.

Eurotia lanata, Moquin.

The "Winter-fat." From Oregon to New Mexico. A dwarf saltbush, valued as holding out on pastures during the frosty season [T. Watson.]

Euryale ferox, Salisbury.

From tropical Asia to Japan, ascending in Cashmir to 5,000 feet, extending northward in Amur to nearly 46° N. Though less magnificent than the grand Victoria Regia, this closely allied water-lily is much more hardy, and would live unprotected in ponds and lakes of a temperate climate. Though not strictly an industrial plant, it is not without utility, and undergoes some sort of cultivation in China for its edible roots and seeds. The leaves attain a width of 3 feet.

Eustrephus Brownii, F. v. Mueller.

East-Australia as far south as Gippsland. This climber produces sweet though only small tubers, which however are probably capable of enlargement through culture.

Euterpe andicola, Brongniart.

Bolivia. Ascends to 9,000 feet [Martius], an altitude higher than is reached there by any other palm unless E. Haenkeana and E. longivaginata (Drude). E. edulis (Martius) extends as far south as Minas Geraes in Brazil.

Euxolus viridis, Moquin. (*Amarantus viridis*, Linné.)

Temperate and tropical regions of Europe, Asia and Africa. Annual; quickly raised. Not without value as a spinage-plant. E. oleraceus is a cognate plant. All easily naturalised.

Excoecaria sebifera, J. Mueller. (*Stillingia sebifera,* Michaux.)

The Tallow-tree of China and Japan. The fatty coating of the seeds constitutes the vegetable tallow, which is separated by steaming. The wood is so hard and dense as to be used for printing-blocks; the leaves furnish a black dye. The tree endures slight night-frosts, though its foliage suffers. It fruits as a rule abundantly.

Exidia auricula Judae, Fries. (*Hirneola auricula Judae,* Fries.)

Widely spread over the globe. Of this edible fungus in 1871 alone the quantity exported from Tahiti to China represented a value ot £7,600 [Simmonds]. Doubtless this useful fungus is

amenable to translocation and subsequent naturalisation. We have it as indigenous in Australia also. The export from New Zealand in 1885 to China was 6,389 cwt., valued at £11,079 [Sir James Hector].

Exomis axyrioides, Fenzl.

South-Africa. A good saltbush there for pastures [McOwan].

Exomis albicans, Moquin. (*Atriplex albicans,* Aiton.)

South-Africa. Praised there as a pastoral saltbush.

Fabiana imbricata, Ruiz and Pavon.

Chili. This small shrub has become valuable as a remedy in cystitis. Other species occur there or in Bolivia or in Brazil, and they will likely be of similar utility.

Fagopyrum cymosum, Meissner.

The perennial Buck-wheat or rather Beech-wheat of the Indian and Chinese highlands, ascending naturally to 11,000 feet [Sir Joseph Hooker]. Can be used with other species for spinage and grain; also a blue dye may be obtained from its leaves.

Fagopyrum esculentum, Moench.*

Northern and Central Asia, extending eastward to Manchuria, growing to an elevation of 12,000 feet in the Himalayas. The ordinary buck-wheat, called Buch-Waizen in Germany, from the resemblance (in miniature) of the seeds to Beech-nuts; hence also the generic name. This annual herb succeeds on the poorest land; clayey soil yields more foliage, but less grain. The crushed amylaceous seeds can be converted into a palatable and wholesome food by boiling or baking, and groats and cakes thus obtained may be consumed even by diabetic patients without aggravation of their malady. The seeds contain about 77 per cent. of amylaceous and saccharine substance [Dr. A. E. Wright]; other analyses gave starch about 50 per cent., gluten about 10 per cent. Starch has also recently been prepared from the seeds as an article of trade. Fagopyrum can be raised with advantage as an agrarian plant for the first crop on sandy but not too dry heath-land, newly broken up, for green manure. It gives a good green fodder, serves as admixture to hay, and is also important as a honey-plant. The period required for the cyclus of its vegetation is extremely short; thus it can even be reared on alpine elevations. In Norway it grows to lat. 67° 56′ [Schuebeler]. The produce of this grain in the United States during 1879 was 13,140,000 bushels, valued at £1,636,000; in 1885 it was 12,626,000 bushels. Much used also in distilleries. A large-grained variety is cultivated in Japan.

Fagopyrum Tataricum, Gaertner. (*Fagotriticum Sibiricum,* Linné.)

Middle and Northern Asia, up to 14,000 feet [Dr. G. Watt]. Yields for the higher mountain-regions a still safer crop than the foregoing; otherwise the remarks offered in reference to F. esculentum apply also to F. Tataricum; but the seeds of the latter are more thick-shelled, less amylaceous and less palatable; all sorts very fattening to fowl. All may be sown for temporary shelter of young tree-seedlings ["*Mildura Cultivator*"].

Fagus antarctica, G. Forster.

From S. Chili to Fuegia. This deciduous Beech is the hardiest of all, still being arborescent at Cape Horn [Sir J. Hooker]. Wood rather heavy, but somewhat brittle [Admiral King]; with F. betuloides the most southern of arboreus plants.

Fagus betuloides, Mirbel.

Patagonia and Fuegia down to Cape Horn. An evergreen Beech, on the branches of which a peculiar edible fungus, Cyttaria Darwinii (Berkeley) occurs. It seems quite feasible, that the Cyttaria-fungs could be transferred from some beeches to others of different countries. Cyttaria Hookeri lives on Fagus antarctica (Forster). C. Darwinii forms for some months of the year a large share of the vegetable food of the Fuegians [Hieronymus].

Fagus Cunninghami, Hooker.

The Victorian and Tasmanian Beech. The Myrtle-wood of local trade. A magnificent evergreen-tree, attaining large dimensions, not rarely to 200 feet in height, with a basal stem-girth of 40 feet, but living only in cool, damp, rich forest-valleys, and bearing through several months annually any periodic snow. Mr. C. French observed a tree on the Upper Latrobe-River 56 feet in stem-circumference. The wood resembles that of the European Beach, thus is easily worked, much used by carpenters and other artisans, and particularly liked for saddle-trees. Average weight of a cubic foot, when quite dry 55 lbs. or 0·830 specific gravity. It remains to be ascertained by actual tests in the forests, whether the allied tall evergreen New Zealand Beeches possess any advantage over this species for forest-culture; they are Fagus Menziesii, the Red Birch of the colonists; F. fusca and F. cliffortioides (J. Hooker), the Black Birches and F. Solandri (Hooker) the White Birch; they ascend to 4,000 feet in the Northern Islands. A magnificent and peculiar beech, Fagus Moorei (F. v. Mueller), occurs in New South Wales on high mountains; its timber is hard, tough and fine-grained [J. Duff]. Cyttaria Gunnii (Berkeley) is the Raspberry-fungus of the Tasmanian and Victorian evergreen Beech; a Cyttaria occurs also on the New Zealand Beeches, as ascertained by the author of this work; it has since been described as C. Purdiei by Mr. J. Buchanan. These fungs are edible in a raw state, and are most palatable (so far as C. Gunnii is concerned) before approaching full ripeness [Rob. Lucas].

Fagus Dombeyi, Mirbel.

The Evergreen Beech of Chili, called there the Coigue or Coihue Of grand dimensions. Canoes can be made out of its stem, large enough to carry 10 tons freight. The wood is still harder than that of Fagus obliqua, with the qualities of which it otherwise agrees [Dr. Philippi]. This species extends to the Chonos-group, and perhaps still further south, and thus may be of value even for Middle European forest-culture.

Fagus ferruginea, Aiton.

North-American Beech. A large tree, with deciduous foliage, easily raised in woodlands. Comparatively quick in growth. Will live in calcareous regions, also in rocky and exposed situations, and endures shade [B. E. Furnow]. Wood variable according to localities. Well seasoned wood, according to Simmonds, is remarkably hard and solid, hence employed for plane-stocks, shoe-lasts, tool-handles, various implements and turneries. The yield of its little nuts is large, and on them domestic animals quickly fatten; they serve also for obtaining oil.

Fagus obliqua, Mirbel.

The Roble of Chili, called Coyam by the original inhabitants. A tall tree with a straight stem, attaining 3 to 4 feet diameter. Wood heavy and durable, well adapted for posts, beams, girders, rafters and joists, but not for flooring. One of the few Chilian trees with deciduous foliage [Dr. Philippi]. Its value as compared with that of the European Beech should be tested in forest-plantations. Cyttaria Berteroi (Berkeley) grows on branches of this Beech.

Fagus procera, Poeppig.

Another deciduous Beech of Chili, where it passes by the name of Reulé or Rauli. Of still more colossal size than the Roble. Wood fissile, well adapted for staves; finer in grain than that of F. obliqua, and much used for furniture [Dr. Philippi].

Fagus silvatica, Linné.*

The deciduous Beech of Britain, of most other parts of Europe and extra-tropical Asia. The trunk has been measured in height to 118 feet, the foliage to 350 feet in circumference. As far north as lat. 60° 23′ in Norway Professor Schuebeler found a tree over 70 feet high with a stem 12 feet in circumference; smaller trees grew even to lat. 67° 56′. Apt to overpower any other kinds of trees in its native forests. The wood is hard, extensively used by joiners and ship-builders in their trade and by the manufacturers of various implements, especially for planes, shoe-lasts, keys and cogs of machinery, lathe-chucks, gun-stocks, staves, chairs, spoke-*shaves*; in piano-manufacture for bridges, likewise in some portion

of the work of organ-builders; enters also into the construction of harmoniums (beds of notes, pallets, rest planks); further used for carved moulds and for wooden letters in large prints; it is of rather difficult cleavage, great compactness and of considerable strength, and resists great pressure. The oil pressed from the nuts is palatable and wholesome. Beech-tar contains a considerable proportion of paraffine; the ashes from any portion of this tree are rich in phosphate of lime. For trimming into copse-hedges many give preference to a purple-leaved variety for show. An allied Beech, Fagus Sieboldii (Endlicher), grows in Japan. In the warmer temperate zones all these could only be grown to advantage in springy mountain-forests. How very long some kinds of timber, when excluded from access of air, may remain preserved, is demonstrated by the fact, that beneath the foundation of Savoy-place, in London, piles and planks of Beech, Chestnut, Oak and Elms were found in a state of almost perfect preservation after 650 years. The wood of the ordinary Beech one of the best for fuel.

Fatsia papyrifera, Bentham, (*Aralia papyrifera,* Hooker.)

Island of Formosa. The rice-paper Plant, hardy in the lowlands of Victoria, and of scenic effect in garden-plantations. Introduced into Victoria in 1854 by the writer. The pith furnishes the material for the so-called rice-paper, also for some sorts of solah-hats.

Ferula alliacea, Boissier.

Persia, up to 7,000 feet. A smaller plant than the following species, but yields the best quality of Assa fœtida, mostly used in India and known there as "Hing" [Watt].

Ferula fœtida, Regel. (*Scorodosma fœtidum,* Bunge.)

Persia, Afghanistan and Turkestan. This very tall perennial herb yields the ordinany medicinal assa fœtida of European commerce. In India it is known as "Hingra" and considered inferior to that from the preceding species [Dr. G. Watt]. F. Assa fœtida, Linné, is a species of doubtful definition. Ferula Narthex, Boissier (Narthex Assa fœtida, Falconer), furnishes a very similar drug in Thibet. The cultivation of these plants in adequate climes seems not surrounded by any difficulties.

Ferula galbaniflua, Boissier.

Persia; on mountains 4,000 to 8,000 feet high. This tall perennial herb might be transferred to other sub-alpine regions, for obtaining locally from it the gum-resin galbanum.

Ferula longifolia, Fischer.

Southern Russia. The long aromatic roots furnish a pleasant vegetable [Dr. Rosenthal].

Ferula Sambul, J. Hooker. (*Euryangium Sambul,* Kauffmann).

Turkestan, at elevations between 3,000 and 4,000 feet. A perennial herb, attaining a height of 10 feet or perhaps more. Yields the true Sambul-root, a powerful stimulant, with the odor of musk It is also a scenic-decorative plant, and proved hardy in England.

Festuca Coiron, Steudel.

Chili. A valuable perennial fodder-grass, according to the testimony of Dr. Philippi.

Festuca dives, F. v. Mueller.*

Victoria, from West-Gippsland to Dandenong, towards the sources of rivers, ascending sub-alpine elevations. One of the most magnificent of all sylvan grasses, often 12 and sometimes when in rank growth on forest-brooks fully 17 feet long. Root perennial or perhaps of only two or three years' duration. Sometimes numerous stems arise from one root. This grass deserves to be brought to any forest-tracts in mild climes, as it prospers in shade; it assumes its grandest forms in deep soil along rivulets. The large panicle affords nutritious forage, so does the young foliage. Cattle are particularly fond of it [J. Pittard].

Festuca elatior, Linné.*

The Meadow-Fescue. Europe, North-Africa, Northern and Middle Asia. A perennial grass, attaining a height of several feet. There are several varieties of this species; the tallest follows rivers readily as far down as the tides reach; the ordinary form is well adapted for permanent pastures, has tender leaves, produces excellent, tasty, nutritious hay, and is early out in the season. Langethal places Meadow-Fescue above Timothy and Foxtail-grass in value, though its copiousness is somewhat less. The seed is readily collected. The tall variety (arundinacea) will occupy wet land preferentially among the best of eligible fodder-grasses. It can be mixed advantageously with F. ovina, is superior to Rye-grass in production and improves with age. It succeeds also on humid and even swampy ground and in forest land as well with sandy as a calcareous subsoil; but it is not adapted for dry poor ground; on the contrary, it is one of the best grasses for irrigated land. Dr. Curl observes, that this and some other Fescues grow vigorously in New Zealand, and yield pasturage there also in the cool season, when Rye-grass is nearly dormant. Chemical analysis, made in spring, gave the following results: Albumen 2·47, gluten 2·75, starch 0·50, gum 2·84, sugar 2·84 per cent. [F. v. Mueller and L. Rummel]. F. arundinacea (Schreber), F. pratensis and F. loliacea (Hudson) are varieties of this species.

Festuca flava, F. v. Mueller. (*Poa flava*, Gronovius; *Tricuspis sesleriodes*, Torrey; *Uralepis cuprea*, Kunth.)

The tall Redtop-Grass of the Eastern States of North-America. A perennial sand-grass with wide panicles. F. scabrella is one of the "Bunch-grasses" of Oregon and California.

Festuca gigantea, Villars.

Europe and Western Asia. A good perennial forest-grass.

Festuca heterophylla, Lamarck.

Europe and Western Asia. This perennial grass is best fitted for cool forest-tracts. Recommended also among lawn-grasses. This species is hardly distinct from F. ovina. It will bear a good deal of drought, and thrives even on lowlying sandy clay and moory soil. Suits best for intermixing with other grasses.

Festuca Hookeriana, F. v. Mueller.*

Alps of Australia and Tasmania. A tall perennial grass, evidently nutritious, required to be tried for pasture-culture, and perhaps destined to become a new meadow-grass of colder countries also elsewhere. Stands mowing and depasturing well; much liked by cattle, horses and sheep [Th. Walton]. F. purpurascens (Banks) is an allied species.

Festuca litoralis, La Billardiére.

Extra-tropical Australia and New Zealand. An important strong perennial grass for binding drift-sand on sea-shores.

Festuca Magellanica, Lamarck.

Extra-tropic South-America. Ascending the Andes to 12,000 feet, and contributing much to the fattening pasturage there [Hieronymus].

Festuca ovina, Linné.

Sheep-Fescue. Europe, Northern and Middle Asia, North-America; found also in South-America and the Alps of Australia and New Zealand. In Greenland it reaches to 79° N.L. This species, like F. elatior, is obtainable with facility. F. duriuscula and F. rubra (Linné) are varieties. A perennial grass, thriving on widely different soils, even moory and sandy; adapted also for alpine and for coast-land; but not equal in nutritive value to many other pasture-grasses, though for poor, dry sheep-runs in cool climes one of the best. It yields a good produce, maintains its virtue, resists drought, and is also well adapted for lawns and swards of parks. F. vaginata (Wildenow) is a form particularly recommended by Wessely for sand-soil. Chemical analysis, made very late in spring, gave the following results: Albumen 1·86,

gluten 8·16, starch 1·45, gum 2·14, sugar 5·05 per cent. [F. v. Mueller and L. Rummel]. F. duriuscula mainly sustains millions of sheep in the upper regions of New Zealand [D. Petrie].

Festuca purpurea, F. v. Mueller. (*Uralepis purpurea,* Nuttal; *Tricuspis purpurea,* A. Gray.

South-Eastern coast of North-America. A tufty sand-grass, but annual.

Festuca silvatica, Villars.

Middle and Southern Europe. A notable forest-grass. F. drymeia (Mertens and Koch), a grass with long creeping roots, is closely allied. Both deserve test-culture. Space does not admit of entering here into further details of the respective values of many species of Festuca, which might advantageously be introduced from various parts of the globe for rural purposes.

Ficus Benghalensis, Linné. (*F. Indica,* Linné partly.)

The Banyan-tree of India, famed for its enormous expansion and air-roots. Height to 100 feet. Although not strictly an utilitarian tree, it is admitted here as one of the most shady trees, adapted for warm and moist regions. At the age of 100 years one individual tree will shade and occupy about one and a half acre, and rest on 150 stems or more, the mainstems often with a circumference of 50 feet, the secondary stems with a diameter of several feet. At Melbourne the tree suffers somewhat from the night-frosts.

Ficus Carica, Linné.*

The ordinary Fig-tree. Alph. de Candolle speaks of it as spontaneous from Syria to the Canary-Islands; Count Solms-Laubach confines the nativity of the Fig-tree to the countries on the Persian Gulf. It attains an age of several hundred years. In warm temperate latitudes and climes a prolific tree. The most useful and at the same time the most hardy of half a thousand recorded species of Ficus. The extreme facility with which it can be propagated from cuttings, the resistance to heat, the comparatively early yield and easy culture recommend the Fig-tree, where it is an object to raise masses of tree-vegetation in widely treeless lands of the warmer zones for shade and fruit. Hence the extensive plantations of this tree made in formerly woodless parts of Egypt; hence the likelihood of choosing the Fig as one of the trees for extensive planting through favorable portions of desert-waste, where moreover the fruit could be dried with particular ease. Small cuttings went quite well, chiefly by horse-post, from Port Phillip to the central Australian Mission-stations, a distance as far as from Petersburg to the Black Sea, or from Bombay to Thibet, or from Capetown to Lake Ngami, or from San Francisco to the Upper Missouri. Maintained its high reputation there as a drought-resisting tree during the worst seasons, and grew best of all fruit-trees. Fig-trees

can be grown even on sand-lands, at least as observed on the Australian south-coast. In Greece the average yield of figs per acre is about 1,600 lbs. [Simmonds]. Caprification was also in this work pronounced unnecessary or even objectionable on the strength of researches by Professor Gasparrini and other former observers. Nevertheless the intelligent cultivators in Anatolia, by whom the Smyrna-Figs, the best of all dried figs, are reared, adhere to the caprification-process, used from time immemorial; moreover they incur much trouble and even sometimes considerable expense for carrying out this procedure, and they contend that without this measure the quite unrivalled quality and extensive maturity of the crop cannot be attained. In California hitherto vain attempts have been made to produce fruit there comparable to the Smyrna-Fig, even on seemingly fitting soil and in proper climatic regions. Therefore the staminate tree was recently introduced into that country, and efforts are made to import also the so-called caprification-fly (Blastophaga grossorum, formerly named Cynips psenes), as no native insect there or elsewhere seems able to carry on the remarkable symbiosis of that Hymenopter. Possibly a stimulating influence is exercised on the development of the whole compound fig-fruit by this process of fecundation It might therefore be desirable to institute renewed experiments, unbiassed by either earliest traditions or recent discardings, to clearly recognise in the light of progressive science the advantages and disadvantages of the ancient custom of aided pollination also in these colonies, and thereby to complete our insight for raising also here the almost unique Smyrna-figs for exsiccation. Sending of special emissaries, to study this question locally in the Levant, would lead to the speediest and safest results. Two main-varieties may be distinguished: that which produces two crops a year, and that which yields but one. The former includes the Gray or Purple Fig, which is the best, the White Fig and the Golden Fig, the latter being the finest in appearance, but not in quality. The main-variety, which bears only one crop a year, supplies the greatest quantity of figs for drying, among which the White Marseillaise and Bellonne, Bourdissotte blanche, Coldi, Signora Blancha et Nero, D'Or de Laura, are considered the best. What in California proved the best variety, as well for drying as for fresh consumption, is called there the White Adriatic. The Barnisote and the Aubique produce delicious large fruits, but they must be dried with fire-heat, and are usually consumed fresh. As regards English literature, sub-varieties are enumerated and their peculiarities recorded in Rees' Cyclopedia by Sir James Smith in 1810, in Dr. Hogg's successive editions of his Fruit-Manual and in several other works. The small brown Malta kind is left to dry on the tree. Noire and Precose del Spagne are among the earliest kinds. The ordinary drying is effected in the sun. Ripens occasionally still its fruits in the lowlands of Scotland, where wall-shelter exists [Loudon]. Import during 1886 into Britain, 114,253 cwt., valued £211,276. For remarks on this and other points, concerning the Fig, the

valuable tract published by the Rev. Dr. Bleasdale should be consulted. The first crop of figs grows on wood of the preceding year; the last crop however on wood of the current year. Varieties of particular excellence are known from Genoa, Savoy, Malaga, Andalusia. For some further information, see among other publications also that of the Hon. the Commissioner of Agriculture, Washington, 1878. Seeds of carefully dried Smyrna figs are fit to germinate [Macmahon]. Dr. Eisen has published an excellent essay on Fig-culture in California. Figs can also be subjected to fermentation and distillation for alcohol.

Ficus columnaris, Moore and Mueller.

The Banyan-tree of Lord Howe's Island, therefore extra-tropical. One of the most magnificent productions in the whole empire of plants. Mr. Fitzgerald, a visitor to the island, remarks that the pendulous aerial roots, when they touch the ground, gradually swell into columns of the same dimensions as the older ones, which have already become converted into stems, so that it is not evident, which was the parent trunk; there may be a hundred stems to the tree, on which the huge dome of dark evergreen foliage rests; but these stems are all alike, and thus it is impossible to say, whence the tree comes or whither it goes. The aerial roots are rather rapidly formed, but the wood never attains the thickness of F. macrophylla, which produces only a single trunk. He saw one individual tree covering two acres. The allied F. rubiginosa of continental East-Australia has great buttresses, but only now and then a pendulous root, approaching in similarity the stems of Ficus columnaris. The Lord Howe's Island Fig-tree is more like F. macrophylla than F. rubiginosa, but F. columnaris is more rufous in foliage than either. In humid, warm, sheltered tracts this grand vegetable living structure may be raised as an enormous bower for shade and for scenic ornament. The nature of the sap, whether available for caoutchouc or other industrial material, requires yet to be tested. A substance almost identical with gutta-percha, but not like india-rubber, has been obtained by exsiccation of the sap of F. columnaris [Fitzgerald]. Thus hardened sap of this species resembles in many respects that of F. subracemosa and F. variegata, called Getah Lahoe, but differs apparently by its greater solubility in cold alcohol, and by the portion insoluble in alcohol being of a pulverulent instead of a viscid character. The mode of exsiccation affects much the properties of the product. The tree also in culture should form a magnificent retreat for singing birds and for epiphytal orchids.

Ficus Cunninghami, Miquel.

Queensland, in the eastern dense forest-regions to about 28° S. Mr. J. O'Shanesy designates this as a tree of sometimes monstrous growth, the large spreading branches sending down roots, which take firm hold of the ground. One tree measured was 38 feet in circumference at 2 feet from the ground, the roots forming wall-

like abutments, some of which extended 20 feet from the tree. Several persons could conceal themselves in the large crevices of the trunk, while the main-branches stretched across a space of about 100 feet. A kind of caoutchouc can be obtained from this tree. A still more gigantic Fig-tree of Queensland is F. colossea (F. v. M.), but it may not be equally hardy, not advancing naturally to extra-tropical latitudes. This reminds us of the great Council-tree, F. altissima, from Java, where it grows in mountains on calcareous ground. F. eugenioides (F. v. M.), from North- and East-Australia, attains a height of 100 feet, and produces also columnar air-roots. It is comparatively hardy, reaching extra-tropic latitudes.

Ficus elastica, Roxburgh.*

Upper India, to the Chinese boundry, known as far as 28° 30 north-latitude, extending to Burmah and the Malayan Islands. A large tree, yielding its milk-sap copiously for the kind of caoutchouc called Assam-Rubber. Roxburgh ascertained 80 years ago, that india-rubber could be dissolved in cajaput-oil (very similar to eucalyptus-oil), and that the sap yielded about one-third of its weight of caoutchouc. This tree is not of quick growth in the changeable and often dry climate of Melbourne; but there is every prospect, that it would advance very rapidly in any mild humid forest-gullies, and that copious plantations of it there would call forth a new local industry. This tree has grown in Assam to 112 feet with 100 aerial roots in thirty-two years [Markham]. In moist warm climes, according to observations in Assam by Mr. Gustave Mann, branches lopped off and planted will speedily establish themselves. Single branches attain a length of 50 feet; the root-crown will attain a diameter of 200 feet exceptionally [Haeckel]. The import of caoutchouc into the United Kingdom in 1884 amounted to 198,000 cwt., representing a value of £2,266,000, of which F. elastica must have furnished a considerable proportion; in 1883 the value of unworked rubber imported there was estimated at £3,500,000 [J. G. Baker]. Markham and Collins pronounce the caoutchouc of F. elastica not quite so valuable as that of the Heveas and Castilloas of South-America. Heat and atmospheric moisture greatly promote the growth of F. elastica. Like most other Fig-trees, it is easily raised from seed. A tree of F. elastica is tapped in Assam when twenty-five years old. After fifty years the yield is about 40 lbs. of caoutchouc every third year, and lasts till the tree is over 100 years old. The milky sap, flowing from cuts in the stem, yields nearly one-third of its weight of caoutchouc; the collected sap is poured into boiling water and stirred till it gets firm; or the sap is poured into large bins partly filled with water; the fluid caoutchouc-mass after a while floats on the surface, when it is taken out and boiled in iron-pans, after the addition of two parts of water, the whole being stirred continuously; after coagulation the caoutchouc is taken out and pressed, and if necessary boiled again, then dried, and finally washed with lime-water. The sap from cuts into the branches is allowed to dry on

the trees [J. Collins]. Dr. S. Kurz states, that F. laccifera (Roxburgh) from Silhet is also a caoutchouc-tree, and that both this and F. elastica yield most in a ferruginous clay-soil on a rocky substratum; further, that both can bear dryness, but like shade in youth. Several other species of tropical figs, American as well as Asiatic, are known to produce fair caoutchouc, but it is questionable, whether any of them would prosper in extra-tropical latitudes; nevertheless for the conservatories of botanic gardens all such plants should be secured with a view of promoting public instruction. To give some idea of the vastly increasing extent, to which "Rubber" is now required, it may be stated, that at Wetzell's factories in Münden and Hildesheim alone during 1884 were produced 100,000 lbs. of surgical articles; 100,000 lbs. valves, buffers and washers; 150,000 lbs. hose and belting; 200,000 lbs. insertion-sheets and tucks-packings; 250,000 dozens of fancy-colored balls, irrespective of other rubber-articles; this factory which exists since 1868, is employing 600 workmen and operating with machinery equal to 300 horse-power. Caoutchouc has been recommended also for inner-lining of war-ships [G. A. F. Wilson]. Ficus Vogelii (Miquel) yields in Liberia and Lagos a kind of rubber, lauded by Messrs. Warne and Christy. The Columbian Rubber-tree is Sapium biglandulosum (J. Mueller).

Ficus infectoria, Willdenow.

India, ascending to 5,000 feet, Probably hardy where frosts are only slight, and then adapted for street-planting. Brandis and Stewart found its growth quicker than that of Siris or Albizzia procera. F. religiosa (Linné) ascends to the same height, and is of quick growth in moist climates. It bears well the clime of Beloochistan. It is one of the trees, on which the lac-insect exists. The fruits of some huge Himalayan species—for instance, H. virgata, F. glomerata (Roxburgh) and F. Roxburghii (Wallich)—are edible. The curious Tikoua from Yun-Nan, introduced into France by the Abbe Delavery, is a creeping species, which ripens its edible fruits underground [E. Goeze]. The bark of a Ficus-species is chiefly used for tanning in Quito [Rev. Prof. Sodiro.]

Ficus macrophylla, Desfontaines.*

The Moreton-Bay Fig-tree, which is indigenous through a great part of East-Australia. Perhaps the grandest of Australian avenue-trees, and among the very best to be planted, although in poor dry soil its growth is slow. In the latitude of Melbourne it is quite hardy in the lowland. The foliage may occasionally be injured by grasshoppers. Easily raised from seed, the smallness of which admits of their very easy transmission to remote places. Growth in height at Port Phillip, 30 feet in 20 years, on favorable soil.

Ficus rubiginosa, Desfontaines.

New South Wales. One of the most hardy of all Fig-trees, and very eligible among evergreen shade-trees, particularly for promenades. It is estimated, that the genus Ficus comprises about 600 species, many occurring in cool mountain-regions of tropical countries. The number of those, which would endure a temperate clime, is probably not small. In New England, Mr. A. R. Crawford noticed trees sending down air-roots 30 feet distant from the main-stem, some nearer forming new stems, others 30 feet in height descending along Angophora-stems, enclosing and suffocating them.

Ficus Sycomorus, Linné.*

The Sycomore-Figtree. Egypt, Abyssinia, Nubia. Copiously planted along the roadsides of Egypt. The evergreen shady foliage, on very spreading branches, extends to a width of 120 feet. Attains an enormous age. A tree at Cairo, which legends connect with Christ's time, still exists. Seven men with outstretched arms could hardly encircle the stem.

Fistulina hepatica, Fries.

Europe and Asia, East-Australia. This large, esculent fungus grows generally on old oak-stems, but does accommodate itself to other habitations also. Its introduction elsewhere is worthy of trial.

Fitzroya Patagonica, J. Hooker.*

Chili, as far south as Chiloe. The Alerce of the Chilians. Grows on swampy, moory places. A stately tree, sometimes to 100 feet high; the diameter of the stem occasionally reaches the extraordinary extent of 15 feet. The wood is almost reddish, easily split, light, does not warp, stands exposure to the air for half a century; in Valdivia and Chiloe almost all buildings are roofed with shingles of this tree [Dr. Philippi]. The outer bark produces a strong fibre, used for calking ships. Like Libocedrus tetragona this tree should be extensively planted in unutilised swampy moors of mountains.

Flacourtia Ramontchi, L'Héritier. (*F. sapida,* Roxburgh).

From Lower India up to Beloochistan. This and F. cataphracta (Roxburgh) form thorny trees with somewhat plum-like fruits. They can be adopted for hedge-copses with other species. Bears at Moreton-Bay.

Flemingia tuberosa, Dalzell.

Western India. The tubers of this herb are said to be edible. Another species, F. vestita (Bentham), is on record as cultivated, for its small esculent tubers, in North-Western India, where it ascends to the temperate region up to 7,000 feet. Both might be improved by culture, F. congesta (Roxburgh) yields a dye.

Flindersia Australis, R. Brown.

New South Wales and Queensland. With Araucaria Cunninghami and Ficus macrophylla, the tallest of all the jungle-trees of its localities, attaining 150 feet. Bark scaly; stem to a diameter of 8 feet. A noble tree for avenues. Rate of growth, according to Mr. Ch. Fawcett, about 25 feet in eight years. Timber of extraordinary hardness [Ch. Moore]. It is so tough as to serve for the yokes of draught-oxen. Mr. Jennings' ingenious method of exsiccating moist substances by the "cool dry air-press," is not only applicable to esculent fruits, but also to any kind of timber, which by this method can be "seasoned" in a few days without splitting or warping.

Flindersia Oxleyana, F. v. Mueller.

The Yellow Wood of New South Wales and Queensland, called "Bogum Bogum" by the aborigines. Its wood is used locally for dye, also for staves as well as that of F. Australis, Tarrietia Argyrodendron, Stenocarpus salignus and Castanospermum Australe. Mr. C. Hartmann mentions, that F. Oxleyana attains a height of 150 feet, and supplies one of the finest hardwoods for choice cabinet-work. Other species occur, among which F. Bennettiana is the best for avenue-purposes. Among other meliaceous trees of East-Australia are very tall: Dysoxylon Fraseri, D. Lesserti and D. Muelleri (Bentham), all three yielding exquisite timber.

Fœniculum officinale, Allioni.

The Fennel. Mediterranean regions, particularly on limestone-soil, extending to Central Asia; certainly wild in Turkestan [Dr. A. von Regel]. A perennial or biennial herb, of which primary varieties occur, the so-called sweet variety having fruits almost twice as large as the other, The herb and fruits are in use as condiments and the latter also for medicine. The fruits are rich in essential oil, containing much anethol. Vilmorin found them to keep their vitality for about four years; he also remarks, that the bleached leafstalks yield Caroselle-salad. A variety, F. dulce (Bauhin), yields its young shoots for boiling as a vegetable of sweetish taste and delicate aroma. Behaved admirably in Central Australia, braving the worst of droughts [Rev. H. Kempe].

Fourcroya Cubensis, Haworth.

West-Indies and continental tropical America. A smaller species than the following, but equally utilised for fibre and impenetrable hedges. Succeds in Natal [J. M. Wood]. F. flavo-viridis (Hooker), from Mexico, is still smaller.

Fourcroya gigantea, Ventenat.

Central America. In species of Yucca, Agave, Dracæna, Cordyline, Phormium, Doryanthes and this as well as a few other Fourcroyas we have gigantic liliaceous and amaryllideous plants avail-

able industrially for fibre. Frost injures the leaves of this species. Development of flower-stalks extremely rapid, up to 30 feet high. Fibre often 3 feet long and of considerable tenacity. The fibre, produced in Mauritius by Messrs. Bourgignon and Fronchet, proved stronger than hemp and resisted decay in water. Mr. Boucard also testifies to the excellence of the fibre, which he describes as long, silky and solid, particularly adapted for luxurious hammocks and for cordage. This fibre is worth in London about £37 the ton.

Fourcroya longæva, Karwinski and Zuccarini.

High mountains of Guatemala and Mexico, particularly at an elevation of about 10,000 feet. One of the most gigantic and magnificent of all liliaceous or amaryllideous plants, in volume only surpassed by Dracæna Draco, the Dragon-tree of the Canary-Islands. This is the principal high-stemmed species, the trunk attaining a height of 50 feet, and the huge panicle of flowers 40 feet more. It does not die, like allied plants, after flowering. The species is recorded here as a fibre-plant, but should also be cultivated for its ornamental grandeur. It has flowered 26 feet high in the cool clime of New Zealand.

Fragaria Californica, Chamisso and Schlechtendal.

California and Mexico. Closely allied to F. vesca. Strawberries can be preserved by being placed successively in layers of sugar, over which salicylic acid is strewn in the proportion of a teaspoonful to 4 lbs. of sugared fruit, or the salicylic acid should be added, dissolved in alcohol.

Fragaria Chiloensis, Aiton.*

Chili-Strawberry. In various of the colder parts both of North- and South-America, occurring also in Juan Fernandez, and at elevations between 4,000 and 6,000 feet in Hawaia (Dr. Hillebrand). Almost incredible accounts have been published regarding the yield of the Chiloen Strawberry in the neighborhood of Brest, far exceeding the fecundity of any other strawberry.

Fragaria collina, Ehrhart.

Hill-Strawberry. In various parts of Europe. Cultivated in Norway to lat. 67° 56′ [Schuebeler]; may be regarded as a mere variety of F. vesca. Fruit of a somewhat musky odor.

Fragaria grandiflora, Ehrhart.* (*F. Ananas,* Miller.)

Ananas-Strawberry. Various colder parts of America. Closely allied to F. Chiloensis. Many of the large-fruited varieties have been derived from this species. The rearing of Strawberries has in California assumed lately such magnitude, that 15,000 cases

could be exported already in 1887 from that State ["Journ. Soc. of Arts," xxxix, 78]. At Auckland, N.Z., 200 acres are planted with Fragaria, the daily yield in the season being about 40 quarts on an acre, worth there sixpence each [B. Dawson].

Fragaria Illinoensis, Prince.

North-America. Hovey's seedling and the Boston-kind from this plant. Is regarded by Professor Asa Gray as a variety of F. Virginiana.

Fragaria pratensis, Duchesne. (*F. elatior.* Ehrhart.)

Cinnamon-Strawberry. "Hautbois." In mountain-forests of Europe. F. moschata (Duchesne) is a variety of this species. The lower portion of the succulent receptacle is seedless.

Fragaria vesca, Linné.*

Wild Wood-Strawberry. Naturally very widely dispersed over the temperate and colder parts of the northern hemisphere, extending northward to Lapland and Iceland, southward to the mountains of Java, ascending the Himalayas to 13,000 feet [J. D. Hooker]. From this typical form probably some of the other strawberries arose. Middle forms and numerous varieties now in culture were produced by hybridization. These plants, although already abounding in our gardens, are mentioned here, because they should be naturalized in any ranges. Settlers, living near some brook or rivulet, might readily set out plants, which with others similarly adapted would gradually spread with the current. Unlike many other plants they are not destroyed by bush-fires. Fragarias are in the lowlands of the tropics best treated as annuals to be productive. The minute seeds will retain their vitality for fully three years. A highland-variety, F. alpina (Persoon) furnishes fruit throughout the warm season, long after the other varieties cease bearing in gardens [Vilmorin]. Dr. Bersch recommends for the preservation of strawberries and any other sort of non-keeping table-fruits a solution of one drachm of salicylic acid and $\frac{3}{4}$ lbs. of sugar in one quart of water, into which the fruits, without boiling, are simply immersed; they will thus keep many months.

Fragaria Virginiana, Miller.

Scarlet Strawberry. Eastern North-America, extending northward to 64° [Sir J. Richardson], therefore adapted for the coldest climates also; yet even fruiting well in Bermuda [Sir J. Lefroy].

Fraxinus Americana, Linné.*

The White Ash. Eastern North-America, extending from Florida to Canada. A large tree, which delights in humid forests. Trunks have been found 75 feet long without a limb, and 6 feet in diameter [Emerson]. It is the best of all American Ashes and of comparatively rapid growth. In Nebraska the stem attains to about 32

inches circumference at 2 feet from the base in 22 years [Furnas]. Resisting extreme heat better than the common Ash. Seeds of this and some other Ashes, unless fresh sown, may lie for a whole year in the ground before germinating. Timber largely exported; it assumes a red tint in age; much valued for its toughness, lightness and elasticity, excellent for work subject to sudden shocks and strains, such as the frames of machines, carriage-wheels, agricultural implements, pick-handles, billiard-cues, fishing-rods, handles, chair-rails, shafts, staves, pulley-blocks, belaying-pins and oars; also for furniture and musical instruments. The young branches are utilized for mast-hoops. The author and Mr. J. G. Luehmann found the strength greater than that of our Blackwood-tree and of many Eucalypts, but not equal to that of E. Leucoxylon, E. siderophloia, E. polyanthema, the best E. globulus and Hickory. Over-old wood not desirable. When once thoroughly seasoned, it does not shrink or swell, and is therefore preferred for flooring to any native timber in Virginia [Robb, Simmonds]. The inner bark furnishes a yellow-dye. The Red Ash (Fraxinus pubescens, Lamarck) and the Carolina-Ash (F. platycarpa, Michaux) are of smaller size, but F. pubescens may sometimes also become large.

Fraxinus Chinensis, Roxburgh.

It is this Ash, on which a peculiar wax is produced by Coccus Pela, perhaps also on some species of Ligustrum. About 40,000 lbs. are exported annually according to Bernardini. F. Mandschurica (Ruprecht) attains a height of 60 feet and a stem-diameter of 4 feet.

Fraxinus excelsior, C. Bauhin.*

The ordinary Ash of Europe and Western Asia, extending to the Himalayas and Thibet, there ascending to 9,000 feet. A tree of comparatively quick growth, known to attain an age of nearly 200 years. It is a very hardy tree, braving the winters of Norway to lat. 69° 40′, though there only a shrub; but in lat. 61° 12′ it attained still a height of 100 feet and a stem-diameter of 5 feet [Schuebeler]. Rich soil on forest-rivulets or river-banks suits it best, although it also thrives on moist sand. Wood remarkably tough and elastic, used for agricultural and other implements, handles, ladders, drum-hoops, carriage-work, oars, axle-trees and many other purposes. Six peculiar kinds of Ash-trees occur in Japan, some also in the Indian highlands; all might be tried for industrial culture.

Fraxinus floribunda, Don.

Nepal-Ash. Himalaya, between 4,000 and 11,000 feet. Attains a height of 120 feet; girth of stem sometimes 15 feet. Serves not only as a timber-tree, but also as a fine avenue-tree. The wood much sought for oars, ploughs and various implements [Stewart and Brandis]. For forest-plantations Ashes are best mixed with beeches and some other trees.

Fraxinus nigra, Marsh. (*F. sambucifolia,* Lamarck.)

Black or Water-Ash of Eastern North-America. Attains a height of 80 feet Requires deep loose soil and humidity, but is indifferent to drainage [Fernow]. Wood still more tough and elastic than that of F. Americana, but less durable when exposed; easily split into thin layers for basket-work; it is also comparatively rich in potash, like that of most of its congeners; for oars and implements it is inferior to that of the White Ash [Simmonds]; much used locally by wagon-builders [Ransome].

Fraxinus Oregana, Nuttali.

California- and Oregon-Ash. A tree, reaching 80 feet in height, preferring low-lying alluvial lands. The wood of this fine species is nearly white, very tough and durable, often used for oars and handles of implements, also in carriage-building, cooperage and manufacture of furniture. Though allied to F. nigra, this ash is superior as a timber-tree. Ash-trees will grow readily in the shade of other trees.

Fraxinus Ornus, Linné.

The Manna-Ash of the Mediterranean regions, extending to Austria and Switzerland. Height about 30 feet. Hardy still at Christiania. It yields the medicinal manna by incisions into the bark, which are done only on one side of the stem each year. F. Ornus is well adapted for a promenade-tree, and is earlier in foliage than F. excelsior, F. Americana and most other Ash-trees.

Fraxinus quadrangulata, Michaux.*

The Blue Ash of North-America, indigenous from Michigan to Tennessee. One of the tallest of the Ashes, becoming 70 feet high. Timber excellent, better than that of any other American species except the White Ash, hence frequently in use for flooring and shingles and carriage-building; it is the most durable of its kind, when exposed to alternate dryness and moisture [B. E. Fernow]. The inner bark furnishes a blue dye. The tree requires a rather mild clime and the most fertile soil.

Fraxinus viridis, Michaux.

The Green Ash of Eastern North-America. Height reaching 70 feet. Less dependent on humidity than many other species. Wood excellent, nearly as valuable as that of the White Ash, but of less dimensions. The tree requires shady woodlands. Especially recommended for street-planting by Dr. J. Warder. This species, like the preceding, is hardy as far north as Christiana in Norway [Schuebeler]. Rate of circumferential stem-growth in Nebraska 30 inches in 22 years [Furnas].

Fuchsia racemosa, Lamarck.

Mountains of Hayti. One of the species with edible berries of very good taste. Fuchsia splendens (Zuccarini) occurs in cold regions of Guatemala up to 10,000 feet high, and produces tasty wholesome berries, the latter an inch and a half long; fit for preserves [Mrs. Beal]; it ripens its fruits at Port Phillip. F. excorticata (Linné fil.) of New Zealand extends there far south, and is perhaps as hardy as F. Magellanica (Lamarck); it rises to 30 feet, if not higher, and gains a stem-diameter of 3 feet; hence a scenic plant even for cool climes. Some of the ordinary garden Fuchias are quite hardy in the south of Ireland.

Galega officinalis, Linné.

Southern Europe and South-Western Asia. A perennial herb, though not equal in value to the best clovers [Langethal], yet recommendable as a fodder-herb on account of the large proportion of its albuminous contents [Stebler]; withstands drought through its deeply penetrating roots. It will live on poor soil, provided, that such is porous; the yield is large.

Garcinia Travancorica, Beddome.

Madras-Presidency, up to elevations of 4,500 feet. This seems to be the hardiest of the superior Gamboge-trees; hence there is some prospect of its prospering in forests of the warmer temperate zone. G. anomala (Planchon and Triana) ascends to 6000 feet in Martaban, but its gamboge is of an inferior kind. G. elliptica (Wallich) furnishes superior Gamboge, but advances up the mountains only to 4,000 feet [Kurz]. G. Cambogia (Desrousseaux), furnishes no useful pigment.

Garcinia Xanthochymus, J. Hooker. (*Xanthochymus pictorius,* Roxburgh.)

India. A middle-sized tree, yields inferior gamboge, but in abundance. It has flowered somewhat outside the tropics in East-Australia [Edgar]. G. morella (Desrousseaux). the best Gamboge-tree, ascends only to 2,000 feet.

Garuleum bipinnatum, Lessing.

South-Africa. A perennial herb of medicinal properties; praised like numerous other plants there and elsewhere as an alexipharmic, but all requiring close re-investigation in this respect.

Gaulthieria Myrsinites, Hooker.

Northern California, Oregon, British Columbia. The fruit of this procumbent shrub is said to be delicious. It would prove adapted for any of the Alps.

Gaulthieria Shallon, Pursh.

North-Western America. This handsome spreading bush would yield its pleasant edible berries in abundance, if planted on alpine mountains, where it would likely become naturalised. G. procumbens (L.) is the North-Eastern American Wintergreen, used in medicine.

Gaylussacia frondosa, Torrey and Gray.*

The Blue Tangleberry of Eastern North-America. A bush with deciduous foliage; fruit very sweet.

Gaylussacia resinosa, Torrey and Gray.*

The Black Huckleberry of North-Eastern America. A dwarf shrub, with deciduous leaves. It likes swampy woodlands, and thus would find ample space in any forest-ranges. Berry of pleasant taste. Perhaps some of the South-American species may also produce edible fruit.

Geitonoplesium cymosum, Cunningham. *(Culcoa cymosa,* Salisbury.)

Through the whole East-Australian forests. It is mentioned here, to draw attention to the likelihood, that special culture may convert this into a culinary plant, as Mr. P. O'Shanesy found the young shoots to offer a fair substitute for Asparagus.

Gelidium corneum, Lamouroux.

On shores of the Atlantic, Indian and Pacific Ocean. This seaweed could by artificial means doubtless be still much distributed beyond its natural locations. Under the name of "Yang-tsai" it is a commercial article for food in China. The jelly of this serves as a substitute for "Agar-Agar" in rearing bacteria. The "gelose" of this plant remains solid at considerable warmth, and thus is particularly well preservable and transmissible [Dr. Dymock].

Gelsemium nitidum, Richard.

Southern States of North-America, also in Mexico. "Yellow Jessamine." A twining shrubby plant, long since introduced into Australia by the writer, with numerous other plants of industrial or therapeutical importance. Recommended in mania, meningitis, neuralgia, irritative coughs, asthma, [Prof. Bartholomew] acts chiefly as an anodyne and thus may induce sleep. Active principle: gelsemin. The perfume of the flowers has also come into use for cosmetics.

Genista monosperma, Lamarck.

Mediterranean regions. One of the best of Broom-bushes for arresting sand-drift. G. sphærocarpa, Lamarck, is of like use, and *also comes* from the Mediterranean Sea.

Genista tinctoria, Linné.

Europe, Northern and Western Asia. A perennial herb, of some medicinal use. From the flowers a yellow dye may be extracted, which with woad gives a good green, and comes well in for domestic dyeing, particularly of wool. A kind of Schüttgelb, different from the one prepared from Maclura tinctoria, is obtained from this Genista, known also as factitium-yellow, and perhaps not altogether to be superseded by picric acid or by Anilin-colors [G. Don; Rosenthal; Brockhaus].

Gentiana lutea, Linné.

Sub-alpine tracts of Middle and Southern Europe. A beautiful perennial herb, yielding the medicinal gentian-root. It could be easily raised in high mountains elsewhere. Chemical principles: gentian-bitter and gentianin. Medicinal gentian-root is also obtained from G. punctata, L., G. purpurea, L. and G. Pannonica, Scop. of the European Alps. The natives of India prize G. Kurroo (Royle), which ascends the Himalaya to 11,000 feet [Dr. G. Watt]. Several native species are used as substitutes in North-America, particularly G. quinqueflora (Lamarck). Their straying into pasture-land must be checked.

Geonoma vaga, Grisebach and Wendland.

West-Indies to Brazil. A dwarf decorative Palm, ascending mountain-regions to 3,000 feet.

Geum urbanum, Brunfels.

The "Avens" of Britain. Europe, North-Africa, extra-tropical and alpine Asia, South-Eastern Australia, North-America. A perennial herb; the powerful anti-dysenteric root, according to Muspratt, contains as much as 41 per cent. of tannic acid.

Gigantochloa Abyssinica, F. v. Mueller. (*Oxytenanthera Abyssinica,* Bentham.)

Tropical Africa. A tall Bamboo, ascending to considerable mountain-elevations.

Gigantochloa apus, Kurz. (*Bambusa apus,* Roemer and Schultes.)

Indian Archipelagus, at elevations under 5,000 feet. Height of stem reaching 60 feet. When young it is used for strings and ropes.

Gigantochloa aspera, Kurz.

Java. Found by Zollinger to attain a maximum-height of 170 feet.

Gigantochloa Atter, Kurz.*

Java, at elevations of from 2,000 to 4,000 feet. Height of stems reaching 70 feet. One of the species much grown for rural and industrial purposes.

Gigantochloa maxima, Kurz.*

Java. Height sometimes 120 feet, the stems nearly a foot thick One of the most extensively cultivated of all Asiatic Bamboos, ascending into mountain-regions.

Gigantochloa nigro-ciliata, Kurz. (*Oxytenanthera nigro-ciliata,* Munro.)

Continental and insular India. Stems to 130 feet long.

Gigantochloa robusta, Kurz.

Mountains of Java. Height to about 100 feet. Kurz noticed the early growth to be nearly 18 feet in a month, the principal branches only commencing when the shoot had reached a height of about 70 feet. Some Java-bamboos are known to measure 22 inches in girth at a height of about 120 feet.

Gigantochloa Thwaitesii, Kurz. (*Oxytenanthera Thwaitesii,* Munro.)

Ceylon, at cool elevations of from 4,000 to 6,000 feet. This pretty Bamboo reaches only 12 feet in height.

Gigantochloa verticillata, Munro. (*Bambusa verticillata,* Blume.)

The Whorled Bamboo of India. It attains a height of fully 100 feet; in damp heat it grows at the astonishing rate of 40 feet in about three months, according to Bouchè. The young shoots furnish an edible vegetable like G. apus and Bambusa Bitung.

Ginkgo biloba, Linné.* (*Salisburia adiantifolia,* Smith.)

Ginkgo-tree. China and Japan. A deciduous fan-leaved tree, to 100 feet high, with a straight stem to 12 feet in diameter. The wood is pale, soft, easy to work and takes a beautiful polish. The seeds are edible, and when pressed yield a good oil. The fruits, sold in China under the name of "Pa-Koo," are not unlike dried almonds, but the kernel fuller and rounder. Ginkgo-trees are estimated to attain an age of 3,000 years. Mr. Christy observes, that the foliage turns chrome-yellow in Autumn, and that it is the grandest and most highly esteemed of all trees in Japan; it will grow in dry situations. In America it is hardy as far north as *Montreal*, in Europe to Christiania.

Gladiolus edulis, Burchell.

Interior of South-Africa. The bulb-like roots are edible, and taste like chestnuts when roasted.

Glaucium luteum, Scopoli.

Western and Southern Europe, Northern Africa and Western Asia. This fast-spreading biennial herb, now also naturalized on some of the Australian coasts, does good service in aiding to subdue drift-sand. The plant has also some medicinal value.

Gleditschia triacanthos, Linné.

The deciduous Honey-Locust tree of South-Eastern States of North-America. Height reaching 80 feet, trunk to 4 feet in diameter. Wood hard, coarse-grained, fissile, durable, even in contact with soil, sought principally for blocks and hubs. The tree is not without importance for street-planting. Rate of circumferential stem-growth in Nebraska, about 40 inches in 22 years at 2 feet from the ground [Furnas]; growth in height at Port Phillip, about 35 feet in 20 years. Sown closely this plant forms impenetrable, thorny, not readily combustible hedges. An allied species, the G. Sinensis, Lamarck (G. horrida, Willd.), occurs in East-Asia. The Water-Locust tree of North-America (G. monosperma, Walt.) will grow to a height of 80 feet in swamps. The flowers of Gleditschia exude much honey-nectar for bees. The somewhat succulent fruit is a poor esculent, but harmless.

Glycine hispida, Bentham.* (*Soja hispida,* Moench.)

An annual herb of India, China and Japan. The beans afford one of the main ingredients of the condiment known as Soja; they are very oily, nutritious, and of pleasant taste when boiled either in a green state or when ripe; in the latter state they need considerable soaking before use. The return from the culture of this plant is ample. The plant endures slight frost [Wittmack]. It is not subject to attacks of insects and fungs [Vilmorin]. Oil is pressed from the seeds. It is also an extremely valuable fodder-plant, according to Dr. G. Watt. Glycine Soja, Siebold and Zuccarini, is said to be a distinct plant, but probably serves the same purpose. Two kinds of Soja-beans exist, one containing to 20 per cent. of oil, which sort is used for pressing, while the less oily kind is used for sauce [James Taylor].

Glycyrrhiza echinata, Linné.

South-Europe and South-Western Asia. From the root of this herb a portion of the Italian liquorice is prepared. The Russian liquorice is also derived from this species. The root is thicker and less sweet than that of the following.

Glycyrrhiza glabra Linné.

South-Europe, North-Africa, South-Western and Middle Asia. The extract of the root of this herb constitutes the ordinary liquorice. The plant grows most vigorously in adequate climes, but requires a deep, rich and friable soil for prolific growth. Propagation best from suckers or cuttings, but a harvest of the roots is only realised in the third or fourth year. The return may come up to as much as four tons on an acre under favourable circumstances. No watering is necessary for this plant. Market value of the root in London now 16s. to 18s. per cwt. [Christy]. Both this and the preceding are hardy in Norway to lat. 59° 55' [Schuebeler]. Liquorice is of some utility in medicine, and also used in porter-breweries. Chemical principle: glycyrrhizin.

Glyptostrobus heterophyllus, Endlicher. (*Taxodium heterophyllum*, Brogniart.)

China. An ornamental tree, allied to Taxodium distichum in some respects, and like that tree particularly fit for permanently wet ground. The Chinese people plant it along the edges of canals and narrow creeks, the buttress of the tree standing actually in moist muddy soil [Dr. Hance].

Gmelina Leichhardtii, F. v. Mueller.

East-Australia, to 35° S.L. Height of tree to 150 feet; stem-diameter to 4 feet. Grown now on a commercial scale for fancy timber-purposes in Queensland. Wood of shining paleness, not liable to rend, particularly valued for ship-decks, flooring-boards and superior implements.

Gonioma Kamassi, E. Meyer.

South-Africa. This small tree furnishes the yellow Kamassi-wood, much sought for carpenters' tools, planes and other select articles of wood-work, also for wood-engraving, according to Dr. Pappe. Flowers deliciously fragrant. The bark contains a pleasantly bitter tonic principle [Prof. McOwan].

Gordonia Lasianthus, Linné.

The Loblolly-Bay. South-Eastern North-America. A handsome tree, growing to a height of 60 feet; flowers snowy white. The wood is extremely light, of a rosy hue and fine silky texture, but unfit for exposure. The bark is extensively employed for tanning in the Southern States. Available for swampy coast-lands.

Gossypium arboreum, Linné.*

The Tree-Cotton. Upper Egypt, according to A. de Candolle, seemingly also Abyssinia, Sennaar and thence to Upper Guinea. A tall perennial species, but not forming a real tree, yielding cotton in the first season. Leaves long-lobed. Bracts with few teeth.

Petals yellow, or in age pink or purple. Seeds brown, disconnected, after the removal of the cotton-fibre greenish-velvety. The cotton of long staple, but also a variety occurs with short staple. The New Orleans cotton (G. sanguineum, Hasskarl) belongs to this species. This cotton-fibre is crisp, white, opaque and not easily separable. All Gossypiums can be regarded as honey-plants.

Gossypium Barbadense, Linné.*

Sea-Island Cotton. From Mexico to Peru and Brazil. Leaves long-lobed. Petals yellow. Seeds disconnected, black, after the removal of the cotton-fibre naked. The cotton of this species is very long, easily separable, of a silky lustre and always white. This species requires low-lying coast-tracts for attaining to perfection. Perennial, but yielding like the rest a crop already in the first season. Cultivated largely in the Southern States of North-America, also in South-Europe, Central and North-Africa, Queensland and various other countries. The cotton-harvest of 1885 in the United States came to fully $6\frac{1}{2}$ million bales, at about 450 lbs. each [J. R. Dodge]; the area there under cotton-cultivation in that year was 18,300,865 acres. G. Kirkii (Masters), from Dar Salam, may be a wild state of G. Barbadense. Another primitive type of this genus in tropical Africa is G. anomalum, according to Dr. Welwitch. The "Kidney-cotton" is a variety with more acuminate leaves. M. Delchevalerie has drawn attention to a new plant, tall in size and exceedingly prolific in bearing, raised in Egypt, called Bamia-cotton, which Sir Joseph Hooker regards as a variety of G. Barbadense. This Bamia Cotton-bush grows 8 to 10 feet high, ripens (at Galveston) fruit in four or five months, and produces 2,500 pounds of cotton and seed per acre. It is remarkable for its long simple branches, heavily fruited from top to bottom. Its cotton is pale-yellow.

Gossypium herbaceum, Linné.*

Persia, Scinde, Cabul and some other parts of tropical and subtropical Asia. Much cultivated in the Mediterranean countries, also in the United States of North-America and in southern Japan. Perennial. Leaves short-lobed. Petals yellow. Seeds disconnected, after removal of the cotton-fibre gray-velvety. Distinguished and illustrated by Parlatore as a species, regarded by Seemann as a variety of G. arboreum. Staple longer than in the latter kind, white-opaque, not easily separating. The wild type of this seems to be G. Stocksii (Masters). Even this species, though supposed to be herbaceous, will attain a height of 12 feet. The root of this and some other congeners is a powerful emmenagogue. A variety with tawny fibre furnishes the Nankin-cotton. Oil pressed from cotton-seeds can be used for human rood, but is inferior to good olive-oil and lard in quality. It has most extensively come into use for various processes of factories, so much so that in 1886 to a value of over half a million sterling was exported from the United

States [J. R. Dodge]. Nearly half a million tons of seeds have lately been crushed a year, a ton yielding about 35 gallons oil, and approximately 750 lbs. oil-cake [Dr. Masters]. Prof. Gulley calculated the harvest of cotton-seeds in the United States during one of the later years at 3,000,000 tons.

Gossypium hirsutum, Linné.*

Upland- or Short-staple Cotton. Tropical America, cultivated most extensively in the United States, Southern Europe and many other countries. Perennial. Seeds brownish-green, disconnected, after the removal of the cotton-fibre greenish-velvety. Staple white, almost of a silky lustre, not easily separable. A portion of the Queensland-cotton is obtained from this species. It neither requires the coast-tracts nor the highly attentive culture of G. Barbadense.

Gossypium religiosum, Linné.* (*G. Peruvianum,* Cavanilles.)

Tropical South-America, southward to Chili. Kidney-Cotton, Peruvian or Brazilian Cotton. Leaves long-lobed. Petals yellow. Seeds black, connected. The cotton is of a very long staple, white, somewhat silky, and easily separated from the seeds. A tawny variety occurs. This is the tallest of all cotton-bushes. and it is probably this species, which occurs in the valleys of the Andes as a small tree, bearing its cotton, while frosts whiten the ground around.

Gossypium Taitense, Parlatore. (*G. religiosum,* Banks and Solander.)

In several islands of the Pacific Ocean. A shrub. Petals white. Seeds disconnected, glabrous after the removal of the fulvous cotton-fibre, which does not separate with readiness.

Gossypium tomentosum, Nuttall. (*G. Sandvicense,* Parlatore. *G. religiosum,* A. Gray.)

Hawaia. Perennial. Petals yellow. Seeds disconnected, after the removal of the tawny cotton-fibre fulvous-velvety, not easily parting with their cotton. The roots are a powerful remedial agent, which however should only be used in legitimate medical practice. The barks of Hamamelis Virginiana and Viburnum prunifolium are antidotes [Phares and Durham]. Staple very short.

For limitation of species and varieties Parlatore's "Specie dei Cotoni" (Florence, 1866) and Todaro's "Osservazioni su Cotone" may be consulted. Information on culture may be sought in Porter's "Tropical Agriculturist" and in Mallet's work on "Cotton" (London, 1862).

The following notes were written for the use and guidance of Victorian colonists:—

There are many parts of our colony, in which all these species of Gossypium could be cultivated, and where a fair or even prolific

cotton-crop may be obtained. Good cotton for instance has been produced on the Goulburn, the Loddon, the Avoca and the Murray-River, particularly in places where water could be applied. All cultivated kinds of cotton-plants are either naturally perennials or become such in favorable climes, although they may be treated strictly as annuals. Some of them will indeed in particular instances grow to the height of 20 feet. The geographical parallels, between which cotton-culture is usually placed, stretch in various girdles between 36° north latitude and 36° south latitude. According to General Capron, cotton is grown in Japan to 40° north latitude, but superior quality is not obtained north of 35°.

The cotton-culture in the Southern States of North-America utilised seven million acres before the civil war, cultivated by a million and a half of Negros; India has now 14 millions acres in cotton, as much as the United States in 1879, the yield in the latter being at an average nearly half a bale per acre, and the export thence in 1881 in value about 260 millions of dollars [J. R. Dodge]; in 1883 the cotton-area of the United States was 16,777,993 acres; in 1882 the cotton-yield there 6,957,000 bales. The importations of raw cotton into the United Kingdon in 1884 amounted to $15\frac{1}{2}$ million cwt., its value being £44,000,000; about two-thirds of this came from the United States. In 1886 the import was 15,312,900 cwt. at a then value of £38,128,110; in 1889 it was 17,298,000 cwt. valued at £45,642,000; cotton-seeds imported that year into Britain came to 277,394 tons valued £1,906,000. The greater part of the cotton produced in the world is worked up in the United Kingdom, where the annual consumption has increased from about 1,014,000 bales (of 400 lbs. each) in the period 1836-1840 to an average of 3,117,000 bales for the period 1876-1880, and to 3,700,000 bales during the last four years. After the United Kingdom, says the "Bulletin du Musée commercial," comes the European Continent; taken as a whole the consumption has there increased during the same period from 521,000 to 3,400,000 bales. The third place is held by the United States, which surpasses all other countries in the rate of increase, as the use for manufacture there rose from 242,000 bales in 1840 to 2,137,000 bales in 1884-85. (Journ. of the Soc. of Arts, 1890). The primary advantages of this important culture are: a return in a few months, comparatively easy field-operations, simple and not laborious process of collecting the crop, and requirement of but little care in the use of the gin-machine in finally preparing the raw material for the market, the woolly covering of the seeds constituting the cotton of commerce. The oil obtained by pressure from the seeds is useful for various technic purposes, and the oil-cake can be utilised like most substances of a similar kind as a very fattening stable-food. This oil can even be used quite well in domestic cookery [Colonel O. Nelson]. Crushed cotton-seed cake without admixture is eaten by cattle and sheep with avidity. Of cotton seeds 212,000 tons were introduced

into Great Britain in 1884, valued at £1,580,000, mostly from Egypt. Sea-Island cotton was raised to great perfection in the northern parts of Victoria fully twenty-five years ago from seeds extensively distributed by the writer; but the want of cheap labour has hitherto militated against the extensive cultivation of this crop, as well as that of tea and many other industrial plants. Cotton having been reared far away from the influence of the sea-air, it would be worthy of attempts, to naturalise various kinds of cotton in the oases of our deserts, irrespective of regular culture. Our native Gossypiums of the interior produce no fibre worth collecting. Cotton-plants have a predilection for gently undulating or sloping ground, with light soil and a moderate supply of moisture. In the most favorable climes, such as that of Fiji, cotton produces flowers and fruit throughout the year, but the principal ripening falls in the dry season. From two hundred to three hundred plants or more can be placed on an acre. As many as seven hundred bolls have been gathered from a single plant at one time, twelve to twenty capsules yielding an ounce of mercantile cotton. Weeding is rendered less onerous by the vigorous growth of the plants. Cotton comes in well for rotation with other crops. Major Clarke has ascertained, that crossing cannot be effected between the oriental and occidental kinds of cotton. A high summer-temperature is needed for a prolific cotton-harvest. Intense heat, under which even maize will suffer, does not injuriously affect cotton, provided the atmosphere is not dry in the extreme. The soil should not be wet, but of a kind that naturally absorbs and retains humidity, without over-saturation. In arid regions it is necessary to irrigate the cotton-plant. Heavy rains at the ripening period are injurious, if not destructive, to the cotton-crop. Dry years produce the best returns, yet aqueous vapor in the air is necessary for the best yield. In colder localities the bolls or capsules continue to ripen, after night-frosts prevent the formation of new ones. Porous soils, resting on limestones and metamorphic rocks, are eminently adapted for cotton-culture. The canebrake-soil of the North-American cotton-regions absorbs ammonia to a prodigious extent.

Gourliaea decorticans, Grisebach.

The Chañar of Argentina. Bears sweet pleasant fruits, and yields a tough valuable wood [Dr. Lorentz].

Gracilaria lichenoides, Greville.

South-Asia, North-Eastern Australia. The "Agar-Agar." An edible seaweed, the mucilage of which has come into preferential use to rear bacteria for microscopic observation. Doubtless, seaweeds could readily in portable aquaria be transferred from one coast to others. The alg above mentioned can be used medicinally instead of caragaheen.

Grevillea annulifera, F. v. Mueller.

West-Australia. A tall bush or small tree, with highly ornamental flowers. The seeds are comparatively large, of almond-taste, and the fruits produced copiously. The shrub will live in absolute desert-sands, where the other Australian proteaceous Nut-tree, Brabejum (Macdamia) ternifolium, could not exist. Well may we plead, that enlightened statesmanship should lastingly preserve at least on a few chosen spots also in South-Western Australia all the splendid Grevilleas and hundreds of other gay or remarkable plants, quite peculiar to that part of the world, where the endemism of vegetation is more singularly and strongly concentrated than anywhere else on the globe, unless in South-Africa and California; so that future generations also may yet be able, to contemplate at least the local remnants of a world of plants as charming as it is diversified and peculiar, before many of its constituents succumb by aggress of herds and flocks altogether.

Grevillea robusta, Cunningham.*

A beautiful lawn-tree, indigenous to the sub-tropical part of East-Australia, rising to 150 feet, of rather rapid growth, and resisting drought in a remarkable degree; hence one of the most eligible trees, even for desert-culture. Cultivated trees at Melbourne yield now an ample supply of seeds. The wood is elastic and durable, valued particularly for staves of casks, also for furniture. The richly developed golden-yellow trusses of flowers attract honey-sucking birds and bees through several months of the year. The seeds are copiously produced and germinate readily. Rate of growth in Victoria. 20-30 feet in 20 years. In Ceylon it attained a stem-circumference of 5 feet in eight years. In India it flourishes at elevations from 2,000 to 7,000 feet

Grindelia squarrosa, Dunal.

North-America in the middle-regions, but extending also far northward. A perennial balsamic herb, praised for medicinal virtues in its native lands. Several congeners occur from California and Mexico to Chili and Argentina. G. robusta (Nuttall) serves therapeutic purposes in California, its use being particularly effective in asthma and bronchial affections [Dr. Gibbons]. Some congeners occur as far south as Chili and Argentina.

Guadua angustifolia, Kunth.* (*Bambusa Guadua,* Humboldt and Bonpland.)

New Granada, Ecuador and probably others of the Central American States. This Bamboo attains a height of 40 feet, and might prove hardy in sheltered places of temperate low-lands. Holton remarks of this species, that it is, after the plantain, maize and cane, the most indispensable plant of New Granada, and that it might be called the lumber-tree, as it supplies nearly all the fencing

and wood-work of most of the houses, and is besides manufactured into all kinds of utensils. The Genus Guadua comprises the stoutest of all Bamboos.

Guadua latifolia, Kunth.* (*Bambosa latifolia,* Humboldt and Bonpland.)

One of the tall Bamboos of Central America, whence several other lofty Bamboos may be obtained, among them the almost climbing Chusqueas. This Guadua is stouter than any Indian Bamboo. In tropical America native Bamboos are planted for hedges. G. amplexifolia (Presl.) is an allied species, which extends from Mexico to Venezuela and attains a height of 60 feet.

Guajacum officinale, Linné.

Antilles and Venezuela. Tree, attaining middle size, but of slow growth. Hardy in Natal, also at Moreton-Bay. Yields the heavy, diagonally fibrous, somewhat odorous, greenish "Lignum Vitae," a wood which is unique in its qualities and much sought for skittle-balls, blocks, pulleys, rulers. The resin is used medicinally and for chemic tests.

Guevina Avellana, Molina.* (*Quadria heterophylla,* Ruiz and Pavon.)

The evergreen Hazel-tree of Chili, extending to the Chonos-Archipelagus. One of the most beautiful trees in existence, attaining a height of 30 feet. The snowy-white flower-spikes produced simultaneously with the ripening of the coral-red fruit. In the cooler southern regions the tree attains considerable dimensions. The wood is tough and elastic, and used particularly for boat-building [Dr. Philippi]. The fruit of the allied South-African Brabejum stellatifolium (Linné) can only be utilized with caution and in a roasted state as an article of diet, because it is noxious or even absolutely poisonous in a raw state.

Guizotia oleifera, De Candolle.

India and probably also Abyssinia. Rantil-oil is pressed from the seeds of this annual herb, which yields its crop in three months. The oil is much used like Sesamum-oil, for culinary as well as for technic purposes. Madia sativa (Molina), a native of Western-America, is excluded from a recommendatory position in this work, as it becomes an irrepressibly troublesome weed.

Gunnera Chilensis, Lamarck.

Caraccas to Patagonia, chiefly on cliffs. A most impressive plant for scenic groups in gardens. Darwin measured leaves 8 feet broad and 24 feet in circumference. It thrives luxuriantly at Port Phillip, when somewhat shaded from intense dry heat. Severe frosts affect it in exposed situations. The acidulous leaf-stalks serve as a vegetable; the thick roots are used for tanning and dyeing. G. peltata (Philippi) is another large species, restricted to Juan Fernandez.

G. macrophylla (Blume) is a native of Java and Sumatra, where it occurs on mountains up to 6,000 feet elevation. G. manicata (Linden) is a Brazilian species, allied to G. Chilensis and still more robust [J. G. Baker].

Gymnocladus Canadensis, Lamarck.

The Chicot or Kentucky Coffee-tree. North-Eastern America. A timber- and avenue-tree, attaining a height of 80 feet; allied to Gleditschia, but as the name implies, thornless. Delights in a rich soil and a sheltered position. Can be raised from cuttings of the roots. The wood is strong, tough, compact, fine-grained, and assumes a rosy color. The pods, preserved like those of Tamarinds, are said to be wholesome [Simmonds]. Insects preying on the foliage of this tree are poisoned by it. It will bear the frosts of Norway to lat. 61° 17′ [Schuebeler].

Gynocardia odorata, R. Brown.

From Burma to Sikkim and Khasia, ascending to 3,000 feet. A tree, to 50 feet high. Seeds large, the oil of which has come into medicinal use as chaulmugra-oil [Christy].

Hæmatoxylon Campechianum, Linné.

From South-Mexico to Venezuela. A tree, attaining 40 feet in height; it yields the Campeche-wood or logwood for dyes and inks, and for a chemical reagent, the latter depending on the principle Hæmatoxylin. The tree flourishes still at a considerable distance from the tropics, thus for instance at Moreton-Bay.

Hagenia Abyssinica, Willdenow. (*Brayera anthelmintica,* Kunth.)

Abyssinia, at elevations from 3,000 to 8,000 feet. A tall tree, admitted in this list, because its flowers have come into medicinal use as an anthelmintic. It is moreover quite eligible for ornamental plantations.

Hamamelis Virginica, Linné.

Eastern States of North-America. The "Witch-Hazel." A shrub or small tree. The leaves are renouned in the States for medicinal properties; the seeds are oily and edible.

Hancornia speciosa, Gomes.

Brazil, to far southern regions, on sandy plains. This small tree may prove hardy in extra-tropic regions free of frost. The good-sized berries are of very pleasant taste, and vernacularly known as **Mangaibas.** Most valuable is the very elastic rubber of this plant. **Mr.** Thomas Christie regards it superior to Para-Rubber, and worth at present 3s. per lb.

Hardwickia binata, Roxburgh.

India, up to elevations of nearly 4,000 feet. Maximum-height of tree, 120 feet. Wood from red-brown to nearly black, close-grained, exceedingly hard, heavy and durable; valued for under-ground work. The bark furnishes easily a valuable material for cordage. The tree can readily be pollarded for cattle-fodder [Brandis].

Harpullia Hillii, F. v. Mueller.

The Tulip-Wood of Queensland. One of the most important of the numerous kinds of trees indigenous there for select cabinet-work. H. pendula (Planchon) is equally valuable.

Hedeoma pulegioides, Persoon.

The Penny-royal of Eastern North-America. An annual herb of aromatic taste, employed in medicine. The volatile oil is also in use.

Hedera Helix, Fuchs.

The Ivy. Europe, Northern Africa, Western Asia as far as the Himalayas. Not to be omitted here, as it quickly forms evergreen walls over all kinds of fences and on sides of buildings without injuring any sound masonry; it is also a bee-plant. Individual plants will live through several centuries. The variety with yellow-marked leaves is singularly ornamental. Resists the smoky air of cities [Loudon]. Hederic acid is of medicinal value. A decoction of the leaves dyes hair black.

Hedysarum coronarium, Linné.*

The Soola-Clover. Southern Europe, Northern Africa. One of the best of perennial fodder-herbs, yielding a bulky return. It is also recommendable as quite a handsome garden-plant and as a honey-plant.

Heleocharis sphacelata, R. Brown.

Australia, New Zealand and South-Sea Islands. This rush is well deserving to be transferred to any swamps in warmer climes on account of its nutritious and palatable tubers.

Heleocharis tuberosa, Roemer and Schultes.

China, where it is called Matai or Petsi. This rush can be subjected to regular cultivation in ponds for the sake of its edible wholesome tubers. For a full account see Paillieux et Bois in Bullet. de la Soc. d'Acclimat. 1888 p. 1030-1035. H. plantaginea (Brown) and H. fistulosa (Schultes) of tropical Asia and Madagascar are allied plants.

Helianthus annuus, Linne.*

The Sun-Flower. Peru. This tall, showy and large-flowered annual is not without industrial importance. As much as fifty bushels of seeds, or rather seed-like fruits, have been obtained from an acre under very favorable circumstances, and as much as fifty gallons of oil can be pressed from such a crop. The latter can be used not only for machinery, but even as one of the best for the table, also for superior toilet-soaps and for painting; it belongs to the series of drying oils. Otherwise the seeds afford an excellent fodder for fowl; they are also used for cakes, and afford a substitute for coffee according to Professor Keller. The leaves serve for fodder. The large flower-heads are important as yielding much honey. The stalks furnish a good textile fibre, and the blossoms yield a brilliant lasting yellow dye. About six pounds of seed are required for an acre. The plant likes calcareous soil. Important also for quickly raising vegetation around fever-morasses, the absorbing and exhaling power of this plant being very large [Dr. v. Hamm]. A good plant, according to Lacoppidan, will exhale 1½ lb. of water during a hot day. Several North-American species may deserve rural culture. The return from a Sunflower-field is attained within a few months. In Norway it can be grown to lat. 70° 4′ [Schnebeler]; yet it will, according to the Rev. H. Kempe, also endure the excessive summer-heat of Central Australia better than any other cultivated herb yet tried there. It answers also cultural purposes quite well in the coast-regions of Queensland [Edgar]. Even when unattended to, will yield in porous soil crops for years.

Helianthus tuberosus, Linné.*

Brazil. Sunflower-Artichoke, inappropriately passing under the name "Jerusalem-Artichoke," instead of "Girasol-Artichoke." The wild state, according to Professor Asa Gray, seems to be the North-American H. doronicoides (Lamarck). The tubers are saccharine and serve culinary purposes. As a fodder they increase the milk of cows to an extraordinary degree. The foliage serves well also as fodder. The plant is propagated from the smallest but undivided tubers, placed like potatoes, but at greater distances apart. The root is little susceptible to frost. The plant would be valuable for alpine regions. In Norway it can be grown successfully still at lat. 68° 24′ [Schnebeler]. The yield is as large as that of potatoes, with less labor, and continues from year to year in fairly treated land uninterruptedly and spontaneously. The stem is rich in textile fibre. The percentage of crystalline sugar is largest during the cold season, then 5-6 per cent. During the summer the starch-like inulin prevails. This plant can only be brought to full perfection in a soil, containing much potash.

Helichrysum lucidum, Henckel. (*H. bracteatum,* Willdenow.)

Throughout the greater part of Australia. This herb can be grown as a summer-plant to lat. 70° 4′ in Norway [Schuebeler]. The regular cultivation of this perennial herb would be remunerative, to supply its "everlasting" flowers for wreaths, just as those of H. orientale (Tournefort) from Canada are largely grown and sold in South-Europe, to provide wreaths for graves. Some South-African species of Helichrysum and Helipterum are also highly eligible for these purposes of decoration; as such may be mentioned Helichrysum fulgidum (Willdenow), H. humile (Andrews), H. sesamoides (Thunberg), Helipterum canescens, H. eximium and H. speciosissimum (De Candolle). Helichrysum apiculatum (De Candolle) affords herbage in the worst deserts of Australia.

Helichrysum vestitum, Schrank.

South-Africa. Perennial. Flower-headlets large, usually snowy-white. Dr. Günther Beck states, that the export of these flowers has risen to a value of a quarter million pounds sterling.

Helicia Whelanii, Bailey.

Bellenden Kers mountains, Northern Queensland. A middle sized tree, producing nuts 2-2½ inches in diameter, which are largely consumed by the autochthones [F. M. Bailey].

Heliotropium Peruvianum, Linné.

Andes of South-America. A perennial somewhat shrubby plant. Among various species of Heliotrope this one can best be utilised for the extraction of the scented oil. Heliotropin obtainable from this and allied plants has been produced synthetically also.

Helipterum Manglesii, F. v. Mueller, (*Rhodanthe Manglesii,* Lindley.)

West-Australia. Annual. The most lovely of Australian everlastings. Most easily raised from seed; easily naturalized in adequate soil and clime. Not disdained by sheep and cattle [Miss Alice Eaton]. Headlets of flowers from a silvery to a rosy lustre. H. incanum (D.C.) extends from the upper Australian Alps into the Central Australian deserts, displaying a remarkable variety of colors. Argyrocome is the oldest generic name

Helleborus niger, Brunfels.

Forest-mountains of Middle and Southern Europe, particularly in sub-alpine regions. The Christmas-rose of British gardens. A perennial handsome herb, remarkable for flowering even in cold countries during mid-winter. The roots are used in medicine; so those of H. viridis (Linné) from the same region. Thrives best where lime prevails in the soil.

Helvella esculenta, Persoon.

Europe. Dr. Goeppert notes among saleable Silesian mushrooms for table-use this species as well as H. gigas (Krombholz) and H. infula (Fries). Kohlrausch and Siegel found in H. esculenta when dried 26 per cent. of protein, against the following other results: in beef 39 per cent., in veal 44, wheat-bread 8, oatmeal 10, pulse 27, potatoes 5, various mushrooms often 33 per cent. Of course starch, sugar, inulin, pectin, gum and even fibre have to be further taken into consideration in these calculations on value of nutriments. The deleterious principle of H. esculenta needs to be removed by repeated treatment with boiling water, or by keeping the dried fungus for about a year before it is used for the kitchen. Dr. M. C. Cooke mentions as fair English substitutes of Morels Helvella lacunosa (Afzelius) and H. mitra (Linné). Bergner and Trog illustrate as edible among fungs of Switzerland H. crispa (Fries).

Hemarthria compressa, R. Brown.

Southern Asia, Southern Africa, extra-tropical Australia. This perennial grass, though somewhat harsh, is recommendable for moist pastures, and will retain a beautiful greeness throughout the year in dry climes; highly esteemed by graziers in Gippsland (Victoria); it is not injured by moderate frost. H. uncinatata is a mere variety, which grows down to high-water mark on estuaries of rivers; also otherwise on somewhat saline ground. H. fasciculata (Kunth) occurs around the Mediterranean Sea. The genus is also represented by one species in the warmer littoral regions of America. Remarkably resistant to drought.

Heracleum giganteum, Hornemann. (*H. villosum,* Fischer.)

Caucasus and Taurus. One of the best of herbaceous scenic plants. Matures seeds freely.

Heracleum Sibiricum, Linné.

Colder regions of Europe and Asia. A very tall biennial herb with leaves of enormous size. Recently recommended for sheep-fodder in alpine regions. This plant could also be turned to account for scenic effect in horticulture, as well as H. dulce (Fischer) of Kamtschatka.

Heterothalamus brunioides, Lessing.

Southern Brazil and Argentina. A dwarf shrub, furnishing the yellow Romerillo-dye from its flowers.

Hevea Guianensis, Aublet.* (*Siphonia elastica,* Persoon.)

Guiana and nearest countries. A tree, rising finally to about 60 feet. To what elevation it does advance into cooler mountain-regions, and whether it will prosper in sub-tropic regions, seems as yet not to have been ascertained. To draw attention to this

subject, the plant is admitted into this work. In the United States were 120 india-rubber factories in 1883, employing 15,000 people. The total importation of raw material there during that year was 30,000 tons, worth about six million pounds [J. G. Baker]. In East-Australia the plant thrives fairly well at least as far south as the tropic of Capricorn [J. S. Edgar].

Hibiscus cannabinus, Linné. (*H. radiatus,* Canvanilles.)

Tropical Asia, Africa and Australia. An annual showy herb, yielding the Ambari-Hemp. Stems to 12 feet high, without ramification if closely sown. Rich soil on the Nile has yielded over 3,000 lbs. of clear fibre from one acre. The bearing strength is often found to be more than that of the Sunn-fibre. The leaves serve as sorrel-spinage. Several other Hibisci can be utilised in the same manner, for instance the Indian H. tetraphyllus (Roxburgh). Good fibre is also obtained from Sida rhombifolia (Linné), but this plant is apt to become in warm zones a most troublesome weed.

Hibiscus elatus, Swartz. (*Paritium elatum,* G. Don).

West-Indies, extending to Guiana. Grows to a tree of good size. It furnishes the Cuba-bast, much used for tying cigars. Hardy in Natal, where it grew in six years to 23 feet [J. M. Wood].

Hibiscus esculentus, Linné.

Tropical Africa. A tall herb. The unripe mucilaginous seed-capsules are known as Ochro, Okra Bandakai or Gumbo, and used as a culinary vegetable. The summers of Victoria bring them to maturity. In Central-Australia it is also only a summer-plant. The Ochro can be preserved by being dried either in the sun or by artificial heat after previous slicing. The leaves of this and allied species can be used as pot-herbs. The seeds retain their vitality for about five years [Vilmorin]. In hot moist countries also multiplied from cuttings, and there growing with amazing quickness. Dr. A. Gibson pronounces the Ochro quite a safe food, even when extensively consumed.

Hibiscus Ludwigii, Ecklon and Zeyher.

South-Africa. A tall, shrubby and highly ornamental species, desirable also as yielding a fibre of fair strength and toughness.

Hibiscus Sabdariffa, Linné.

Tropical Asia and Africa. The Oseille de Guinée. A showy annual plant, occasionally of more than one year's duration, admitting of culture in the warmer temperate regions; it is however cut down by frost. It yields the Rosella-fibre. The acidulous calyces furnish a delicious sorrel and rosella-jellies, particularly relished in hot climes; they serve also for pickles. An allied

culinary species occurs on the Senegal. H. digitalus (Cavanilles) is another cognate species of similar utility from Brazil. H. punctatus (Dalzell and Gibson) is mentioned as an annual fibre-plant, occurring in Sindh and Mooltan.

Hippophae rhamnoides, Linné.

Europe, Western and Central Asia. One of the best of shrubs for binding sand on sea-shores. Ascends to 15,000 feet in Thibet.

Hierochloa redolens, R. Brown.

South-Eastern Australia, there almost confined to the Alps; also in New Zealand, in the Antarctic Islands and the southern extremity of America. A tall, perennial, blady grass, with the odor of Anthoxanthum. It is worthy of dissemination on moist pasture-land in cool countries. H. borealis of the colder regions of the northern hemisphere accompanies H. redolens in the south, but is a smaller grass. These grasses are to some extent valuable for their fragrance as constituents of hay, the odorous principle, as in Anthoxanthum, Melilotus and Asperula, being cumarin. Hierochloas are particularly appropriate for cold, wet, moory grounds.

Hippocrepis comosa, Linné.

The Horse-shoe Vetch. Middle and Southern Europe, North-Africa. A perennial fodder-herb, not without importance. Likes stony ground, and delights like most leguminous herbs in limestone-soil. The foliage is succulent and nutritious. Professor Langethal recommends it for a change after Sainfoin-pastures fail. It furnishes not quite as much but an earlier fodder.

Holboellia acuminata, Lindley.

In the Himalayan mountains at 4-9,000 feet elevation. Under the above name H. latifolia and H. angustifolia are united, as neither of the two appellations, given by Wallich, applies to the species as a whole. The berries (fruitlets) of this climbing shrub are large, and in the natural localities of the plant consumed for food. They may on culture get ameliorated; they remind in taste of the fruit of the Passion-flower.

Holcus lanatus, Linné.

Velvet-grass or Meadow-Softgrass, also known as Yorkshire-foggrass. Europe, North-Africa, Middle Asia. Indigenous in Norway to lat. 63° 34′. A well-known and easily disseminated perennial pasture-grass of considerable fattening property. For rich soil better grasses can be chosen, but for moist, moory or sandy lands and also for forests it is one of the most eligible pasture-grasses, yielding an abundant and early crop; it is however rather disliked by cattle as well as horses. One of the best rural grasses

in recently cleared forest-ground, not—like Cocksfoot-grass and particularly Rye-grass—apt to be attacked by caterpillars; also suited for suppressing bracken-ferns after they have been burnt down. Recommendable also for newly drained land. Bears continued grazing off extremely well. Also thrives according to the Rev. H. Kempe in the hottest and driest regions of Central Australia. Particularly dangerous for the spreading of the ordinary rust-fungus, Puccinia graminis (Uredo linearis). The chemical analysis, made in full spring, gave the following results:—Albumen, 2·20; gluten, 4·11; starch, 0·72; gum, 3·08; sugar, 4·56 per cent [F. v. Mueller and L. Rummel].

Holcus mollis, Linné.

Creeping Softgrass. Of nearly the same geographic range and utility as the preceeding species. Particularly adapted to sandy forest-land. Grown in Norway to lat. 63° 7′ [Schuebeler].

Holoptelea integrifolia, Planchon. (*Ulmus integrifolia,* Roxburgh.)

The Elm of India, extending from the lowlands to sub-alpine regions. A large tree, with timber of good quality. Foliage deciduous.

Hordeum andicola, Grisebach.

Argentina. Pronounced by Prof. Hieronymus as an excellent pasture-grass of the Sierras.

Hordeum deficiens, Steudel.

The Red-Sea Barley. One of the two-rowed barleys, cultivated in Arabia and Abyssinia. Allied to this is H. macrolepis (A. Braun), a native of Abyssinia.

Hordeum distichon, C. Bauhin.*

Wild from Arabia to Central Asia [A. de Candolle]. The ordinary Two-rowed Barley. Cultivated as early as the stone-age [Heer]. To this species belong the ordinary English barley, the Chevalier, the Annat, the Dunlop, the Long-eared, the Black, the Large, the Italian and the Golden barley, along with other kinds. A variety with grains free from the bracts constitutes the Siberian- and the Haliday-barley, which however is less adapted for malt. An unbearded variety, called the Berkeley-Barley, was recently raised by Professor Hilgard in California; it approaches the Nepal-Barley, but the husk is adherent. This new sort is not so liable to the attacks of rusts-fungs as many other varieties. Dry barley-flour, heated to the temperature of boiling water during several hours under the exclusion of atmospheric air, constitutes Hufeland's meal for invalids. Barley-culture can be carried on even in alpine regions. Marly and calcareous lands are particularly fit for rearing this cereal grass. It resists moderate spring-frosts. As much as 100 bushels of Cape-barley have been obtained from an acre of land in volcanic soil of Victoria as a first harvest.

Hordeum hexastichon, Linné.*

Orient. The regular Six-rowed Barley. In cultivation already during the stone-age [Heer], also already in ancient Egypt [Schweinfurth]. This includes among other varieties the Red, the Scotch, the Square- and the Bear-barley. Seeds less uniform in size than those of H. distichon. The so-called skinless variety is that, in which the grain separates from the bracts. Langethal observes, that it is most easily raised, requires less seed-grain than ordinary barley, has firmer stems, is less subject to the rust-disease and to bending down.

Hordeum secalinum, Schreber.* (*H. nodosum,* Smith; *H. pratense,* Hudson.)

Europe, Northern and Middle Asia, North-America. Perennial. Famed as the best fattening grass of many of the somewhat brackish marsh-pastures on the North-Sea. It never fruits, when kept down by cattle, and finally suppresses nearly all other grasses and weeds.

Hordeum vulgare, Linné.*

Orient. The Four-rowed Barley, though rather six-rowed with two prominent rows. Of less antiquity than H. distichon and H. hexastichon. Had the Alexandrian Library not been burnt, the exact origin of the various kinds of Barley, with that of many other leading culture-plants, would have been on reliable record. Barley can, by proper choice of season, even be grown in Central-Australia. The cultivation of this cereal extends further northward and southword than that of wheat, oats and rye in the northern hemisphere, because it comes to maturity quickly enough to avoid the high temperature and also any dryness of the hot clime, as well as the low temperature of the autumns of the cold zone. Thus, hardy varieties still succeed even in the Faroe-Islands. Several varieties occur, among them: the Spring- and Winter-barley, Black barley, the Russian, the French, the Naked and the Wheat-barley. Pearl-barley is obtained from the winter-variety, which also surpasses Summer-barley in rigor of stems and rich and early yield, it being the earliest cereal in the season; the straw is copious and nutritious, and the grain is rich in gluten, hence far better adapted for flour than for malt. Summer-barley also passes under the name of Sand-barley. It is inferior in yield to H. distichon, but is content with a less fertile, even sandy soil, and comes to ripeness in a month's less time. In alpine regions it ripens with a summer of sixty or seventy days without frost. In Norway it can be grown to lat. 70° [Schuebeler]. The Naked barley is superior to many other varieties for peeled barley, but inferior for brewing; the grain is also apt to drop [Langethal]. Malt is important as an antiscorbutic remedy. Chemical principles of malt: asparagin, a protein substance, diastase, an acid and cholesterin-fat. Maltine is a therapeutic extract.

Hordeum zeocriton, Linné.*

Central Asia. A Two-rowed Barley. To this species belong the Sprat-, the Battledore-, the Fulham- and the Putney-barley, the Rice-barley, the Turkish-barley and the Dinkel. This species might be regarded as a variety of A. distichon. The grains do not drop spontaneously, and this kind is securer than others against sparrows; requires however a superior soil and is harder in straw [Langethal].

Hovenia dulcis, Thunberg.

Himalaya, China, Japan. The pulpy fruit-stalks of this tree are edible. The plant is hardy still at Philadelphia; it dislikes drought. H. inæqualis (De Candolle) and H. acerba (Lindley) are mere varieties of this species.

Humulus Lupulus, Linné.*

The Hop-plant. Temperate zone of Europe, Asia and North-America. Very hardy, being indigenous in Norway to lat. 64° 12′ and cultivated to lat. 69° 40′ [Schuebeler]. This twining perennial unisexual plant is known to yield enormously on river-banks in rich soil or on fertile slopes, where irrigation can be effected. A pervious, especially alluvial soil, fertile through manure or otherwise, appliances for irrigation natural or artificial, and also shelter against storms are some of the conditions for success in hop-growth, and under such conditions the raising of hops will prove thus far profitable in countries and localities of very different mean-temperature. A dry summer season is favorable to the ripening and gathering of hops. On the Mitchell-River, in Gippsland, 1,500 lbs. have been obtained from an acre; on the King-River, in Victoria, even as much as 2,286 lbs. in one particular year. In Tasmania large crops have been realized for very many years. The plant might be readily naturalized on river-banks and in forest-valleys. The scaly fruit-catkins form the commercial hops, whose value largely depends on the minute glandular granules of lupuline. Hops impart their flavor to beer, prevent acetous fermentation, and precipitate albuminous substances from the malt principally by their tannic acid. Hop-pillows are recommended to overcome want of sleep. Many of the substitutes for hops are objectionable or deleterious. The refuse of hops of breweries possesses double the value of stable-manure. Great Britain imported in 1884 nearly 13,000 tons of hops valued at £1,600,000; in 1889 about 10,000 tons of the value of £713,000. The Victorian import during 1887 was 788,968 lbs. valued at £42,422. Active principles of hop-leaves and fruits: a peculiar volatile and bitter acid substance. The fibre of the stem can be made into cords and paper. The young shoots can be used for food, dressed like asparagus.

Hydnum coralloides, Scopoli.

Europe, Asia, North- and South-America. In Cashmere, where this mushroom inhabits hollow trunks of Pinus Webbiana, called the Koho-Khur. Common on dead wood in forests in the United States. Cooked, of excellent taste.

Hydnum imbricatum, Linné.

In pine-forests of Europe. A wholesome mushroom of delicious taste, which we should endeavour to naturalize in any pine-plantations. Other recommendable European species are, H. erinaceum (Persoon), H. album (Persoon), H. diversidens (Fries), H. auriscalpium (Linné), H. subsquamosum (Batsch), H. lævigatum (Swartz), H. violascens (Albertini), H. infundibulum (Swartz), H. fuligineoalbum (Schmitz), H. graveolens (Brotero), H. Caput Medusæ (Nees), H. hystrix (Fries). These and some other edible fungs are given on the authority of Rosenthal's valuable work. The Rev. M. J. Berkeley, Dr. Morren and Dr. Goeppert add Hydnum repandum (Linné) and H. suaveolens (Scopoli).

Hydrangea Thunbergi, Siebold.

Japan. The leaves of this shrub give a peculiar tea, called the "Tea of Heaven" locally.

Hydrastis Canadensis, Linné.

The Yellow Puccoon or Golden Seal. Eastern North-America. A perennial herb, utilised in medicine. The root contains two alkaloids, berberin and hydrastin. The root-dye is of a brilliant yellow, admitting of its use with indigo for rich green colors.

Hymenæa Courbaril, Linné.

Tropical and Southern sub-tropical America. A tree of colossal size and remarkable longevity. Timber hard, extremely heavy, close-grained, used for select wheel-work, treenails, beams and planks, also in various machinery. Courbaril-wood exceeds the British oak four times in elasticity and nearly three times in resistance to fracture [Lapparents]. A fragrant amber-like resin, known as West-Indian Copal, exudes from the stem. The Mexican trade-name of the resin is Coapinole. The beans of the pod are lodged in a mealy pulp of honey-like taste, which can be used for food. The chance of the adaptability of this remarkable tree to the warmer temperate zone needs to be ascertained. This is one of the Algaroba-trees. H. verrucosa (Gaertner) and Trachylobium Petersianum (Klotzsch) yield the best East-African and Madagascar-Copal.

Hymenanthera Banksii, F. v. Mueller.

South-Eastern Australia, New Zealand, Norfolk-Island. A tall spiny shrub, well adapted for close hedges, where rapid growth is not required. It stands clipping well. Flowers profusely fragrant; hence this plant is among those best to be chosen for maintaining successively a strong fragrance in gardens of serene climes.

Hyoscyamus niger, Linné.

The Henbane. Europe, North-Africa, extra-tropical Asia. In Norway indigenous to lat. 63° 35′. An important medicinal

herb of one or two years' duration. It contains a peculiar alkaloid —hyoscyamin. H. albus (Linné) is used in South-Europe as well. Oulmont and Laurent pronounce daturin from various species of Datura as physiologically almost identical with hyoscyamin.

Hyphæne Argun, Martius.

Nubia, to 21° north-latitude. Possibly hardy anywhere on lowlands in the warmer temperate zone.

Hyphæne coriacea, Gaertner.

Equatorial Eastern Africa; the dichotomous Palm of the sea-coast-regions. It attains a height of 80 feet. Deserving of cultural trials in cooler latitudes also.

Hyphæne crinita, Gaertner. (*H. Thebaica,* Martius,)

The Gingerbread-Palm or Doum-Palm. Abyssinia, Nubia, Arabia and Egypt, as far as 31° north latitude, and southward to the Zambesi, Nyassa and Sofala. In Arabia to 28° north latitude [Schweinfurth]; up to the plateau of Abyssinia [Drude]. It is much branched, and attains a height of about 30 feet. The mealy husk of the fruit is edible. Grows away from the sea.

Hyphæne ventricosa, Kirk.

Zambesi. Loftier than the other species. Stem turgid towards the middle. Fruit large. Perhaps not absolutely requiring a tropical clime.

Hypochœris apargioides, Hooker and Arnott.

Chili. A perennial herb. The root is used for culinary purposes like that of Scorzonera Hispanica.

Hypochœris Scorzonerœ, F. v. Mueller. (*Achyrophorus Scorzonerœ,* D.C.)

Chili. Of the same use as H. apargioides. Allied species of probably similar utility exist in Western South-America.

Hyssopus officinalis, Linné.

South-Europe, South-Western Asia. A perennial herb, discarded and re-introduced in medicine. The essential oil of this herb is also used for some perfumeries.

Ilex Aquifolium, Linné.

Tha Holly. Europe, Western Asia. In some cold regions the only evergreen tree not coniferous. Known to have attained an age of more than 150 years, a height of 60 feet and a stem-circumference of $8\frac{1}{2}$ feet. Important as a hedge-plant. It yields a wood for ornamental turnery, mathematic and other instruments,

remarkable for its almost whitish paleness In Norway it is indigenous to lat. 63° 7′, and in lat. 59° 45′ it attained still a height of nearly 50 feet [Professor Schuebeler]. The berries are deleterious.

Ilex Cassine, Linné.

Southern States of North-America. Hardy in England. A tea-bush, to which also remarkable medicinal properties are ascribed. Ilex opaca (Aiton) attains a height of over 50 feet in Alabama.

Ilex crenata, Thunberg.

Japan. The wood employed there for superior kinds of wood-cuts. This shrub proved hardy in Holland (C. Koch).

Ilex integra, Thunberg.

Japan. Bird-lime can be prepared from the bark of this and several other hollies; from this species at the rate of 10 per cent.

Ilex Paraguensis, St. Hilaire.

The Maté. Uruguay, Paraguay and Southern Brazil. This kind of Holly-bush, which attains finally the size of a small tree, is inserted into this list rather as a stimulating medicinal plant than as a substitute for the ordinary Tea-plant, although in its native country it is very extensively used as such. From the province of Parana alone more than 36 million pounds were exported in 1871, besides 9 million pounds used for home-consumption; while in Rio Grande de Sul the local provincial consumption is nearly four times as much, not counting large quantities consumed by the aboriginal race. It is cheaper than coffee or tea (about 5d. per lb.), but an individual there uses about 1 lb. per week. It has a pleasant aroma, can be taken with milk and sugar, and is the favourite beverage in large portions of South-America [Dr. Macedo Soares]. The leaves destined for the Maté are slightly roasted. This plant was introduced as long ago as 1854 into the Melbourne Botanic Garden, where it thrives fairly well. I. Dahoon (Walter) and I. dipyrena (Wallace) are used for the same purpose, and probably other hollies may be found occasionally fair substitutes. I. theezans (Martius) also yields in Southern Brazil a kind of Maté. Chemical principles: coffein, quina-acid and a peculiar tannic acid, which latter can be converted into viridin-acid.

Ilex verticillata, Gray. (*Prinos verticillatus,* Linné.)

Eastern North-America. There the bark much used for medicinal purposes, both externally and internally.

Illicium verum, J. Hooker.

Southern-China. The Star-Anise. An evergreen shrub or small tree. The starry fruits used in medicine and as a condiment. Their flavour is derived from a peculiar volatile oil with anethol; this essential oil is in use for a particular liqueur. It has only now been placed beyond doubt, that it is this plant—just specifically defined—which furnishes the Star-Anise. See Dyer's "Kew Bulletin," July, 1888.

Illippe butyracea, F. v. Mueller. (*Bassia butyracea,* Roxburgh).

India, up to 4,500 feet. A tree, gaining a height of 50 feet. The pulp of the fruit is edible. The seeds yield a white soft fat, of pleasant smell, used in the making of pomades, ointments, superior soap and candles.

Illippe latifolia, F. v. Mueller.* (*Bassia latifolia,* Roxburgh.)

The "Mahwa." Central India, extending to Ava, ascending to 4,000 feet [J. Hooker]. A tree to 50 feet high, content with dry, stony ground; enduring slight frost. Wood so tough as to be adapted for ploughs and various machinery [Dr. Schlich]. The succulent corolla affords a never-failing crop of nourishing saccharine food to the rural inhabitants. Each tree supplies 2 to 3 cwt.; each hundredweight yields on distillation about 3 gallons of spirits; essential oil is also obtained from the corolla. The flowers are also used for feeding cattle; they will keep for a long time. The seeds yield oil of thick consistence. I. neriifolia is an allied species, which ascends also to 4,000 feet. I. Erskineana and I. Maclayana (F. v. M.), as well as I. Cocco (Scheffer) furnish good edible fruits in New Guinea, where these trees ascend to some distance in the mountain-regions.

Imperata arundinacea, Cyrillo.

South-Europe, North-Africa, Southern and Eastern Asia, Australia, Polynesia. The Lalang-grass of India. Almost a sugar-cane in miniature. Valuable for binding sand, especially in wet localities. Difficult to eradicate. Available also for thatching. Apt to become irrpressible in cultivation-grounds. Browsed on by pasture-animals, though harsh.

Indigofera Anil, Linné.*

Recorded as indigenous to the West-Indies, and extending spontaneously through continental America from Carolina to Brasil. A shrub, several feet high. Pods sickle-shaped, short, compressed. One of the principal indigo-plants under cultivation, both in the eastern and the western hemisphere. Only in the warmer parts of the temperate zone can we hope to produce indigo with remunerative success. But many of the hardier species seem never yet to

have been tested for pigment. Over 100 have already been recorded from extra-tropical Southern Africa alone. An Indigofera of Georgia, said to be wild, perhaps I. Anil, yields an excellent product. The pigment in all instances is obtained by maceration of the foliage, aeration of the liquid and inspissation of the sediment.

Indigofera argentea, Linné. (*I. cærulea,* Roxburgh).

Tropical and extra-tropical Northern Africa, Arabia and perhaps India. A shrub, several feet high, closely allied to I. Anil, and likewise a good Indigo-plant.

Indigofera tinctoria, Linné.*

Warmer parts of Asia, as far east as Japan; recorded also from tropical Africa and even Natal as wild. A shrubby plant, attaining a height of 6 feet. Pods straight, cylindrical, many-seeded. Extensively cultivated in warm zones for indigo, and probably hardy in mild temperate regions. The plant is frequently sold fresh by the grower to the factories. The indigo-plant requires a rich friable soil, neither too moist nor too dry. The seeds are sown in furrows about a foot apart, and in hot damp climes the plant can be cut in about two months, as soon as it begins to flower; in six or eight weeks it yields a second crop, and under favourable circumstances as many as four crops can be gathered in a year. The plants have to be renewed every year, as the old ones do not yield an abundant produce. Bright sunshine favors the development of the dye-principle, but frequent rains cause a more luxuriant growth [Hartwig]. In 1884 Great Britain imported 104,000 cwt. of indigo, valued at £2,484,000; in 1889 the import there was 90,238 cwt., valued at £1,777,000.

Inula Helenium, Linné.

The Elecampane. Middle and Southern Europe, Middle Asia eastward to Japan. A perennial herb. The bitter and somewhat aromatic root, for the sake of its stimulating and tonic properties, used in medicine. It contains also the amylaceous inulin and the crystalline helenin. With many other large herbs adaptable for scenic effects.

Ipomœa Batatas, Poiret.* (*Batatas edulis,* Choisy.)

The Sweet Potato. Tropical South-America. First brought to Europe from Brazil. It has proved well adapted also for the southern part of Australia and for New Zealand. Thriving singularly well even during seasons of drought in Central Australia; weight of tubers to 1 lb. there not quite rare. [Rev. H. Kempe]. The copious starch from the tuber forms a good substitute for Arrow-root (or rather Aru-root). The tuberous roots afford a palatable food, more nutritious than ordinary potatoes; they can

also be well utilised for starch. Varieties with red, white and yellow roots occur. Each tuber weighs generally from 3 to 5 lbs., but may occasionally attain to 56 lbs. in adequate climes and soils. Rich yield is 200 to 300 bushels from an acre. Becomes an exhaustive crop. The total harvest of tubers in the United States was estimated for 1886 to have been 40 million bushels, this culture extending to 40° N. there. [J. R. Dodge.] Propagation from small tubers or stem-cuttings or tuber-buds. Professor Wittmack obtained seeds from the ancient graves of Ancon.

Ipomœa Batatilla, G. Don.

Cooler regions of Venezuela. The tubers serve as sweet potatoes. I. platanifolia (Roemer and Schultes), from Central America, and I. mammosa (Choisy), from Amboina, are similarly useful.

Ipomœa Calobra, Hill and Mueller.

Eastern Central Australia. Hardy in the south of France [Prof. Naudin]. The stems cover the ground for a radius of several yards; the spots become picturesque by the showy large flowers for 8 months in the year; the tubers are formed at 4 or 5 yards' distance along running roots, weigh from 5 to 30 lbs., and are a fair esculent. The plant likes a ferruginous loam [Rev. Dr. Woolls].

Ipomœa chrysorrhiza, J. Hooker.

New Zealand, where it is called by the Maories, "Kuneara." The tubers serve like those of I. Batatas, and several varieties are distinguished in cultivation.

Ipomœa costata, F. v. Mueller.

Central and North-Western Australia. Produces edible tubers.

Ipomœa graminea, R. Brown.

Tropical Australia. The root, called "Mallamak," is eaten by the natives either raw or baked [Foelsche].

Ipomœa megapotamica, Choisy.

Southern Brazil and Argentina. The root attains several pounds weight, and serves as jalap. Propagation by pieces of the root or from cuttings of the underground-stem.

Ipomœa paniculata, R. Brown.

Almost a cosmopolitan plant on tropical coasts; this also indigenous to North-Australia and the warmer parts of East-Australia. The tubers of this species also are edible. If hardy, the plant would deserve cultivation in any mild extra-tropical countries also.

Ipomœa pes caprae, Roth.

Tropical and sub-tropical sea-shores of both hemispheres. Can be used in coast-regions free of frost, to bind drift-sand. Preferentially chosen for this purpose by Colonel Worster in Madras.

Ipomœa purga, Wenderoth.

Mountains of Mexico. The true Jalap. This species yields the medicinal jalap-root. It has recently been cultivated with apparent success even at New York. Particularly entitled to a trial in warm woodlands. Active principle: the resinous convolvulin. I. Orizabensis (Ledanois) also yields jalap, according to Hanbury.

Ipomœa simulans, Hanbury.

Mexico. From this species the Tampico-jalap, or rather the Sierra-Gorda-jalap, is derived. I. operculata (Martius) yields the Brazilian jalap.

Iris Florentina, Linné.

Countries around the Mediterranean Sea. The well-known "Orris-root" is obtained from this species. Of the same geographic range is Iris juncea (Poiret), the edible root of which is known by the name of Zeloak among the Algerian natives [Symonds]. I. versicolor (Linné) of Eastern North-America is there drawn into medicinal use.

Isatis indigotica, Fortune.

Northern China. Perennial, almost shrubby. Its use is similar to that of the following plant.

Isatis tinctoria, Linné.

Dyer's Woad." From the Mediterranean regions through part of the Orient, apparently extending as far as Japan. In Norway it is hardy to lat. 67° 16′ [Schuebeler]. A tall herb of two years' duration. The blue dye is obtained from the fermented leaves. Woad succeeds best in rich limestone-ground. Contains luteolin. Many other species of Isatis, mostly Asiatic, may perhaps produce dye with equal advantage. Boissier enumerates twenty-eight kinds merely as Oriental.

Jacaranda mimosifolia, D. Don,

Brazil. This tree, with J. Braziliana and J. obtusifolia (Humbolt), furnishes a beautiful and fragrant kind of Palixander-or Palissandre-wood, and so do probably some other tropical American species. This wood is bluish-red, traversed by blackish streaks. J. mimosifolia is hardy at Melbourne, soon recovering from the injuries of our slight nocturnal frosts, and thus may perhaps be reared with advantage in many of the warmer and moister regions of the temperate zone, if it were only for its ornamental grandeur.

Jacksonia cupulifera, Meissner.

West-Australia. It might prove an advantage, to disseminate this small tree in arid desert-regions, as horses and cattle relish the foliage amazingly. Several other Jacksonias share the local renown, which this congener of theirs has acquired from its utility as a pasture-bush, notably so the tall-shrubby J. scoparia of South-Eastern Australia; it would, therefore, be worth while to disseminate these kinds of plants in apt localities.

Jasminum grandiflorum, Linné.*

From India to Japan. Flowers white. Extensively cultivated in South-Europe. It is planted in rows 3 feet apart. Leek, tuberoses and similar plants are used, to occupy the spare-ground for the first year; 1,000 plants in the second year after grafting produce 50 kilos (about 1 cwt.) of flowers in rich soil. Ten thousand lbs, can be produced on a hectare (nearly 2½ acres); these under very favorable circumstances will realise a profit of £230 per annum. Dr. Piesse records, that in very recent times at Grasse, Cannes and the adjoining villages about 100,000 lbs. of Jasmin-flowers were gathered annually for perfumery-purposes, the price there being about 1s. a lb. According to the "Revue des Sciences Naturelles Appliquées" of May 1891 p. 720, the quantity seems to have risen to fully 300,000 lbs., gathered from the middle of May to the end of June. The plants must be guarded against frost and exposure to wind [Dehérain]. In France this jasmin is generally grafted on J. officinale. The bushes are richly manured and well watered. Ordinary cleft-grafting is practised. the stock being headed down to near the ground. A good workman and assistant will graft about 1,000 plants in a day. The delicate scent is withdrawn, either by fixed oil or fat through alcohol, if not required by itself, or it may be drawn over along with oil of orange-peel. The pecuniary yield obtainable from Jasmin-cultivation seems vastly overrated, even if inexpensive labor could be procured. The concrete oil is an article of commerce. Messrs. Blogg prepare it in the following superior and expeditious manner here: Fresh flowers without stalks are macerated for some few minutes in deodorized methyl-chloride; the liquid is then allowed to run off into a closed receiver for subsequent distillation; this maceration proceeds till all scent is withdrawn by additional methyl; the distillation is effected at a temperature of only about 86° F.; this volatises the methyl-chloride, which when thus regained is used for treatment of other lots of flowers. The concrete oil, as containing the perfuming principle in a waxy or fatty nature, remains behind after the evaporation of the methyl, and is worth about 30 shillings an ounce. A small quantity of this solid substance suffices for preparing a good deal of the "essence" ordinarily in use.

Jasminum odoratissimum, Linné.*

Madeira. Shrubby like the rest. Flowers yellow. Used like the foregoing and following for perfumery. This may be prepared by spreading the flowers upon wool or cotton, slightly saturated with olive or other fixed oil, and covering them with other layers so prepared. The flowers are renewed from time to time until the oil is thoroughly pervaded by the scent, when the latter is withdrawn by alcohol. Other modes of extracting the oil seem feasible.

Jasminum officinale, Linné.*

From the Caucasus to China. Flowers white. This is the principal species cultivated in South-Europe for its scent. In Cannes and Nice about 180,000 lbs. of jasmin-flowers are produced annually for distillation [Regel]. By Simmonnet's process the essence of jasmin is solidified as jasminin.

Jasminum Sambac, Aiton.

From India to Japan. It has the richest perfume of all. The bush attains a height of 20 feet, and is almost climbing. The flowers are white, and must be collected in the evening before expansion. The relative value of many other species of jasmin, nearly all from the warmest parts of Asia, seems in no instance to have been ascertained, so far as their oils or scents are concerned. The Australian species are also deliciously fragrant, amongst which J. lineare, Br., occurs in Victorian deserts; while also J. didymum, Forst., J. racemosum, F. v. M., J. simplicifolium, Forst., J. calcareum, F. v. M., and J. suavissimum, Lindl., reach extra-tropical latitudes.

Joannesia princeps, Vellozo, (*Anda Gomesii,* A. de Jussieu.)

Southern-Brazil. A large tree, likely hardy in any region free of frost. The oil of the seeds serves like that of Ricinus, with the advantage of its being of rather pleasant taste, and being required in much lesser quantity [Martius]. This oil, on account of its quickly drying, has come into use also for painting in oil-colors [Rosenthal].

Jubæa spectabilis, Humboldt.

The tall and stout Coquito-Palm of Chili, extending spontaneously to 37° South; hardy still in Valdivia. Adapted for mild extra-tropical latitudes. A kind of treacle is obtained from the sap of this palm. A good tree will give 90 gallons of mellaginous sap [C. Darwin]. The small kernels are edible. Stem reaching a height of 60 feet, turgid towards the middle; leaves sometimes 10 feet long. Has endured at Montpellier a winter cold of + 10° F. [Osw. de Kerchove de Denterghem]. Jubæa Torallyi ascends the Andes to 8,500 feet. First introduced into the colony of Victoria by the writer of this work.

Juglans cinerea, Linné.*

The Butternut-tree of Eastern North-America. About 50 feet high; stem-diameter to 4 feet. Growth of comparative celerity; admits of transplantation readily. Likes rocky places in rich forests, but is also content with poor soil. Wood lighter than that of the black walnut, durable and free from attacks of insects. It is particularly sought for furniture, panels of coaches, corn-shovels, wooden dishes and similar implements, as it is not heavy nor liable to split. Splendid for select posts and rails needing durability; it is soft and therefore easily worked. This tree with J. nigra endures even the severe frosts of St. Petersburg, where the Caryas can no longer be maintained [Regel]. The kernel of the nut is more oily than that of the ordinary walnut; taste similar to that of Brazil-nuts. The leaves, bark and husk are of medicinal importance, and so are those of other species. The sap is saccharine [C. Koch].

Juglans cordiformis, Maximowicz.

Japan. This species approaches in many respects J. Sieboldiana.

Juglans Mandschurica, Maximowicz.

Corea and Mandschuria. This Walnut is allied to J. cinerea of North-America. Wood splendid for cabinet-work. The nuts available as well for the table as for oil-factories.

Juglans Californica, S. Watson.

From California to New Mexico, along the course of streams in rich moist soil. A handsome symmetrical tree of much utility, attaining a height of 60 feet and a stem-diameter of 3 feet [Dr. Gibbons]. Hardy in Christiania still.

Juglans nigra, Linne.*

Black Walnut-tree. Eastern North-America. Attains a height of 80 feet; trunk grows to 6 feet in diameter; fond of rich forest-land. Quicker of growth than the European walnut-tree, but the wood not so easily worked [Meehan]. Maximum rate of circumferential stem-growth in Nebraska 4 feet at two feet from the ground in 16 years [Furnas]. The tree will bear fruit after 10 years, giving, when of large size, 10 to 15 or even 20 bushels in a season, realising as much as 4 shillings per bushel. The tree is hardy still in Christiania, Norway. Wood most ornamental, purplish-brown, turning dark with age, strong, tough, not liable to warp nor to split; not attacked by insects. Supplies three-fourths of the material for hardwood-furniture in the United States [Sargent], and fetches there the highest price. Wood stored for many years is the best for gun-stocks, and used also for musical instruments. For the sake of its compactness, durability, and its susceptibility to high polish, it is much sought for elegant fur-

niture, stair-rails and other select purposes. Seeds more oily than the European Walnut. The tree extends in a slightly altered variety to Bolivia and Argentina.

Juglans regia Linné.*

The ordinary Walnut-tree of Europe, indigenous in Hungary [Heuffel] and Greece [Heldreich], extending from the Black Sea to Beloochistan and Burmah, and seemingly also occurring in North-China, preferentially in calcareous soil. It attains a height of fully 100 feet, and lives many centuries. Professor Schuebeler found it hardy in Norway to lat. 63° 35′, bearing fruit occasionally; in lat. 60° 14′ it attained still a height of nearly 50 feet and a stem-circumference of 13 feet. An aged walnut-tree at Mentmore had a circumference of 12½ feet at 4 feet from the ground, its branches spreading diametrically to about 100 feet [Masters]. Wood light and tough, much sought for gun-stocks, the exterior of pianofortes and the choicest furniture. The shells of the nut yield a black pigment, the leaves serve also for dye-purposes, and have come further into external medicinal use. Trees of select quality of wood have been sold at enormous prices, being the most valuable of Middle-Europe. To economize it, frequently it is cut up into veneers. In some departments of France a rather large quantity of oil is pressed from the nuts, which, besides serving as an article of diet, is used for the preparation of fine colors. To obtain first-class fruit, the trees are grafted in France [Michaux]. Bordeaux alone exports about 65,000 cwt. of walnuts annually. An almost huskless variety occurs in the north of China. Nuts for distant transmission, to arrive in a fit state for germination, are best packed quite fresh in casks between layers of dry moss.

Juglans Sieboldiana, Maximowicz.

Throughout Japan, where it forms a large tree. To this species is ascribed, by Mr P. G. Bixford, a tree now much grown in California; the leaves are very large; the nuts are produced early, regularly and in abundance, from 15 to 20 often clustered together, have a shell not so thick as that of the Black Walunt; the kernel is in taste like that of the Butternut, but less oily [R. J. Turnbull; L. Burbank].

Juglans stenocarpa, Maximowicz.

From the Amoor-territory. Allied to J. Mandschurica.

Juniperus Bermudiana, Hermann.*

The Pencil-Cedar of Bermuda and Barbadoes, occurring also in Jamaica (there up to 6,000 feet), the Bahamas and Antigua. This species grows sometimes to 90 feet high, and furnishes a valuable red durable wood, used for boat-building, furniture and particularly pencils, also for hammer-shanks of pianofortes, on account of its

pleasant odor and special fitness. It is almost the only native timber of Bermuda. Planks of 32 inches width have been obtained [Lieut-General Sir J. H. Lefroy]. The tree will thrive in the poorest soil, for instance coral-sand, and has a very great power to resist storms on account of the deeply penetrating roots, which may reach to 30 feet. Parlatore unites with this the J. Barbadensis (Linné), but Grisebach regards it as distinct. Many of the plants in gardens called Thuya or Biotia Meldensis belong to this species.

Juniperus brevifolia, Antoine.

In the Azores, up to 4,800 feet; a nice tree with sometimes silvery foliage.

Juniperus Cedrus, Webb.

A tall tree of the higher mountains of the Canary-Islands.

Juniperus Chinensis, Linné.

In temperate regions of the Himalayas, up to an altitude of 15,000 feet, also in China and Japan. Hardy in Christiania [Schuebeler]. This tree is known to rise exceptionally to about 100 feet, with a stem-girth of 13 feet; it is of comparatively rapid growth, furnishing a reddish, soft and fine-grained wood, suitable for pencils [Hoopes]. Probably identical with it is the Himalayan Pencil-Cedar (Juniperus religiosa, Royle). The timber of some other tall Junipers needs tests.

Juniperus communis, Linné.

Colder parts of Europe, Asia, North-Africa and North-America, ascending the European Alps to 8,000 feet, the Indian mountains to 14,000 feet. In Norway it is indigenous to lat. 71° 10′, and under 60° 10′ it reaches still a height of 40 feet. [Professor Schuebeler]. Attains to almost incredible longevity. The wood resists insects of all kinds. Glowing wood is kept for a very long time in that state, if covered up [Goethe]. One of the three native Coniferæ of Britain. The berry-like fruits are of medicinal value, also used in the preparation of gin, further for flavoring preserves and also smoked beef [Dr. K. Mueller]. Important for fuel in the coldest regions. Will grow on almost pure sand, also on limestone-rocks.

Juniperus drupacea, La Billardière.

Plum-Juniper. A very handsome long-leaved species, the "Habhel" of Syria. It attains a height of 30 feet, and produces sweet edible fruit, highly esteemed throughout the Orient.

Juniperus excelsa, Bieberstein.

In Asia Minor, 2,000 to 6,000 feet above the sea-level. Extends to the Himalayas, where its range of elevation is from 5,000 to

14,000 feet. At stately tree, to 90 feet high. Trunk short, but of great girth, over 20 feet circumference being known, according to Stewart and Brandis, who refer to this the J. Chinensis of Parlatore.

Juniperus flaccida, Schlechtendal.

In Mexico, at from 5,000 to 7,000 feet altitude. A tree reaching 30 feet in height, rich in sandarac-like resin.

Juniperus fœtidissima, Willdenow.

Armenia and Tauria, also on the Balkan and in North-Greece, at from 5,000 to 6,500 feet. A tall and beautiful tree.

Juniperus Mexicana, Schiede.

Mexico, at elevations from 7,000 to 11,000 feet. A straight tree, sometimes to 90 feet high; stem to three feet in diameter. exuding copiously a resin similar to sandarac.

Juniperus occidentalis, Hooker.

North-California and Oregon, ascending to 5,000 feet. A straight tree, to as much as 80 feet high, with a stem reaching often 3 feet in diameter. Thrives well among rocks. Wood pale, comparatively hard, close-grained.

Juniperus phœnicea, Linné.

South-Europe and Orient. A small tree, yielding an aromatic resin.

Juniperus procera, Hochstetter.

In Abyssinia and Arabia. A stately tree, furnishing a hard, useful timber. A specious of this genus extends to Kilimanjaro [Jos. Thomson].

Juniperus recurva, Hamilton.

On the Himalayas, from 7,500 to 15,000 feet. A tree attaining 80 feet in height according to J. Hoopes.

Juniperus sphærica, Lindley.

North-China A handsome tree, sometimes to 40 feet high.

Juniperus Virginiana, Linné.*

North-American Pencil-Cedar or Red Cedar, extending to 45° N.L. eastward and 52° westward; likes limestone-subsoil. A drooping variety exists. Hardy still in Christiania. A handsome tree, rarely to 90 feet high, supplying a fragrant timber; it is dense, fine-grained, light and of pleasant odor; the inner part is of a beautiful red color; the outer is white; it is much used for pencils;

one of the best of all woods for buckets, tubs and casks. Simmonds observes, that fence-posts of this wood last for ages. Of wonderful durability for railway cross-ties [Barney]. The heartwood is almost imperishable [Vasey], nor is it bored by insects. The tree grows best near the sea, but is rather independent of soil and locality. Rate of growth in Nebraska according to Governor Furnas 26 inches stem-girth at 2 feet from the ground in 12 years. One cwt. of wood yields in distillation at an average 28 ounces of fragrant oil, used for scented soaps [Piesse, Lubin].

Juniperus Wallichiana, J. Hooker and Thomson.

From the Indus to Sikkim, at elevations from 9,000 to 15,000 feet. Attains a height of about 50 feet. Desirable for transfer to any Alps. Wood similar to that of J. excelsa [Stewart and Brandis].

Justicia Adhatoda, Linné.

India; enduring the climate of the lowlands of Victoria. This bush possesses anti-spasmodic and febrifugal properties. It can be utilized also as a hedge-plant.

Kennedya Stirlingi, Lindley.

South-Western Australia. This perennial bulky herb is highly praised as a pasture-plant by Mr. Ch. Harper.

Kentia Baueri, Seemann. (*Rhopalostylis Baueri,* H. Wendland and Drude).

The Norfolk-Island Palm. Height to 40 feet.

Kentia Beccarii, F. v. Muell r. (*Nengella montana,* Beccari).

On the mountains of New Guinea, up to 4,500 feet. This slender palm is only a few feet high and eligible for domestic decoration.

Kentia Belmoriana, Moore and Mueller. (*Howea Belmoriana,* Beccari).

The Curly Palm of Lord Howe's Island; about 40 feet high. With its congeners evidently designed to grace our gardens, and to become also important for horticultural traffic abroad. K. Forsteriana is a close ally, restricted to the same island.

Kentia Canterburyana, Moore and Mueller. (*Hedyscepe Canterburyana,* H. Wendland and Drude.)

Umbrella-palm of Lord Howe's Island. Likewise a tall and hardy palm, growing at or below 2,000 feet altitude. Rate of growth about one foot a year.

Kentia Moluccana, Beccari.

Ternate, at heights up to 3,500 feet. This noble and comparatively hardy palm attains a height of about 90 feet.

Kentia sapida, Blume. (*Rhopalostylis sapida,* H. Wendland and Drude).

The Nika-palm of New Zealand and the Chatham-Islands. It rises to a height of about 40 feet, is one of the hardiest of all palms, and extends to the most southern latitude attained by any palm, being found down to 44° South. Proved hardy in Stewart's Island [Charles Traill]. The unexpanded flower-spikes can be converted into food as palm-cabbage.

Knightia excelsa, R. Brown.

The Rewa-Rewa of New Zealand. The wood of this tree is recommended as valuable for ornamental work and furniture [Campbell Walker].

Kochia eriantha, F. v. Mueller.

Proved an excellent fodder-herb for sheep on the hot and dry pastures of Central Australia, where the temperature in summer reaches 120° F. in the shade, and in the winter falls to 27° [Rev. H. Kempe]. Several other Australian species of Kochia afford excellent pasture-fodder. Prof. W. A. Dixon found 65 per cent. of digestible substance in K. pyramidata (Bentham).

Kochia pubescens, Moquin.

South-Africa; there one of the best salt-bushes for pastures [McOwan].

Kochia villosa, Lindley.*

In most of the depressed and saline regions of Australia, particularly inland, also on sand-lands. Renowned amongst occupiers of pasture-runs as the "Cotton-bush," strangely so called, on account of downy adventitious excrescences. This rather dwarf shrub resists the extremes of drought and heat of even the trying Central Australian clime. The roots sometimes penetrate into the ground to a depth of 18 feet [Lockh-Morton]. With all other pasture-animals also dromedaries like this and some other salt-bushes particularly for food; so also ostriches [Officer]. These kinds of plants can be multiplied also from cuttings.

Koeleria cristata, Persoon.

Widely dispersed over the globe. A perennial grass of fair nutritive quality, sustaining itself on dry soil. The closely allied K. glauca can be sown with advantage on coast-sand. Prof. Hieronymus mentions K. caudata (Grisebach) among good grasses of the Southern Andes, occurring in the cold elevations from 10,000 to 12,000 feet.

Krameria triandra, Ruiz.

Chili, Peru and Bolivia, at elevations of from 3,000 to 8,000 feet. This pretty little shrub can be grown on sandy ridges in an equable

clime. It produces the medicinal Ratanhia-root, well known also as a dentrifice, and used further for coloring wine. The root contains 38 to 43 per cent. tannin [Muspratt]. Some other species have similarly astringent roots, particularly K. Ixine (Loefling), from Central America and the West-Indies. Some could be chosen to aid in adorning and diversifying our gardens. Krameria is placed by Eichler among cæsalpinous Leguminosæ.

Kunzea pomulifera, F. v. Mueller.

Southern coast of Australia. This creeping or somewhat shrubby plant is well worth naturalisation on other sandy or rocky shores in mild climates, on account of the berries, called "Muntries" by the aboriginals, yielding excellent jam or preserves. It occurs also in the deserts of the interior, but is there not readily fruiting into succulence.

Lactuca sativa, C. Bauhin.*

Southern Asia. The ordinary annual Lettuce, in use since remote antiquity. It is not without value for medicinal purposes, especially as a sedative. L. Scariola (Linné) seems to be the wild state of the garden-lettuce, and is a native of all the countries around the Mediterranean Sea. Messrs. Dippe in Quedlinburg devote exclusively 130 acres to the culture of lettuce merely for seed. Mons. Vilmorin notes the seeds to retain their power of germination for about five years. L. altissima, (Bieberstein), is a variety attaining a height of 9 feet. All yield lactucarium. Succeeds also in equinoctial latitudes, thus thriving also fairly well in the hot and moist depressions of the Malayan Peninsula [H. N. Ridley]. It ripens seeds even in the hot desert-regions of Central Australia. Picridium vulgare (Desfontaines) of the countries at the Mediterranean Sea is there occasionally consumed as lettuce. L. perennis (Linné) is there a pot-herb [Naudin].

Lactuca virosa, Linné.

Middle and South-Europe, North-Africa, Middle-Asia. A biennial. The inspissated juice particularly of this lettuce forms the sedative lactucarium.

Lagenaria vulgaris, Seringe.

Tropical Asia and Africa, perhaps also Australia. An annual climber, rather a plant of curiosity than of utility in the rural sense of the word, but cultivated in India for making calabashes and also employed in medicine. A variety occurs with edible fruits.

Lantana crocea, N. Jacquin.

Central America. One of the most grateful and ornamental plants for low hedges, flowering all through the year, and not apt to spread detrimentally, as do some of its tropical congeners. All the species are of some medicinal value.

Lapageria rosea, Ruiz and Pavon.

The Copigué. Chili. Almost the only plant, which can exist in the area covered by the sulphurous smoke of the local smelting furnaces [Dr. R. O. Cunningham]. A half-woody climber with large showy flowers. The berries, which attain the size of a hen's egg, are sweet and edible. The plant bears slight frosts. Best adapted for mild moist regions. The plant would particularly prosper in the main Rhododendron-zone, aud with us in the Waratah-country.

Lardizabala biternata, Ruiz and Pavon.

Chili. A climber with stems of enormous length. Might be naturalised in forests for obtaining the tough fibre for cordage. In its native country the torrified stems are used instead of ropes, according to Dr. Philippi.

Laserpitium aquilegium, Murray.

Middle and Southern Europe. The stems of this perennial herb are edible. The fruit serves as a condiment.

Lasiocorys Capensis, Bentham.

South-Africa. Professor McOwan directs attention to the economy of this plant, it having a singular propensity of rendering rainwater retained in small gutters; the Lasiocorys compacts the detritus and impedes also soil washed onward, forming natural little catch-dams. The plant is bitter, hence not consumed by goats and sheep in plentiful times.

Lathyrus Cicera, Linné.

Countries at or near the Mediterranean Sea, also Canary-Islands. An annual, similar in its use to L. sativus, furnishing a tender palatable fodder on sandy soil.

Lathyrus latifolius, Linné.

South-Europe, South-Western Asia. A perennial herb, not without importance for fodder [Prof. Wittmack]. Bees resort much to the flowers [G. Don].

Lathyrus macrorrhizus, Wimmer. (*Orobus tuberosus,* Linné.)

Europe, Western Asia. This herb would gradually establish pasturage in sterile forest-regions, and could with some allied species be disseminated also in alpine elevations.

Lathyrus Ochrus, De Candolle.

Countries around the Mediterranean Sea. Recommended as a good fodder-herb, though annual.

Lathyrus pratensis, Linné.

The Meadow-Pea Europe, Northern and Middle Asia. Hardy in Norway to lat. 69° 40′. A good perennial pasture-herb. It can also be utilised for forest-pastures, like L. silvestris, L. The yield is considerable, and the herbage, though bitter, is relished by sheep. The plant spreads easily, particularly on fresh ground. L. tuberosus, L., can likewise be utilised as a fodder-herb; its tubers are edible, but very small; the plant is easily naturalised, but may in culture-land become an irrepressible weed.

Lathyrus sativus, Linné.

The Jarosse. Middle and Southern Europe. An annual forage-herb. Can be grown in Norway to lat. 63°26′ [Schuebeler]. Superior to vetches in quality of fodder and seed, but inferior in yield; according to Langethal's observations content with a lighter soil, hence often chosen for first sowing on sand-lands; a useful ingredient of mixed pasturage. Lime in the soil increases the return. In India it is grown as a cold weather crop, often on very heavy clay-soils, which will raise no other kind of pulse [Dr. G. Watt]. The seeds can only be used with great caution and well boiled, as their frequent or continuous use, like that of L. Cicera, induces paralysis, not only in horses, cattle and birds, but also in the human subject. The plant should therefore only be used for its herbage. L. Aphaca (Linné), L. purpureus (Desf.) and L. Clymenum (L.) are also recorded as deleterious. Similarly some species of Astragalus and Swainsona are very hurtful as fodder, others not. The seeds of L. sativus will keep about five years. Probably other species of Lathyrus could advantageously be introduced.

Lathyrus silvester, Linné.

Europe, Western Asia, Northern Africa. A perennial rambling herb, enduring alpine and arctic cold. Recommended as a forage- or pasture-plant, adapted particularly for growth on declivities, even if these are stony or sandy; likes however phosphatic and potassic substance in the soil [Prof. Wittmack]. Should here be particularly valuable in scrubby ranges. The dry plant shows on analysis to contain 25 per cent. Protein [Prof. Stebler].

Launæa pinnatifida, Cassini.

Coasts of tropical Asia and East-Africa. A perennial herb, with creeping and rooting stems, arching from node to node [Hooker], by which means it keeps down drift-sand [Cleghorn, Bidie]. In this respect the plant has rendered such good services on the Indian coasts, that its transfer to other shores in frostless zones seems desirable, particularly as it does not stray away from the coast to invade cultural lands.

Laurelia aromatica, Jussieu.

Southern Chili. A colossal tree, in Valdivia the principal one used for flooring. Wood never bored by insects, and well able to stand exposure to the open air, far superior to that of L. serrata (Bertero), the "Vouvan or Huahuoa," which tree predominates over L. aromatica in the far south of Chili [Dr. Philippi].

Laurus nobilis, Linné.

South-Europe and Asia Minor. The Warrior's Laurel of the ancients, generally called in Britain "Sweet Bay." Greatest height about 60 feet, but always displaying a tendency to omit suckers and rarely assuming a tree-like character [Loudon]. The leaves are in much request for various condiments, always much sought for packing liquorice, and for their peculiar aroma these Bay-leaves cannot be replaced by any others, unless those of Lindera Benzoin and Machilus odoratissima. The berries are used in veterinary medicine.

Lavandula angustifolia, C. Bauhin. (*L. vera,* De Candolle.)

The principal Lavender-Plant. Countries around and near the Mediterranean Sea. Of somewhat shrubby growth; from it, by distillation, the best oil of lavender is prepared; the English being superior to others. It lives on dry soil, but is less hardy than the following, still it will grow in Norway to lat. 59° 55′ [Schuebeler]. A thousand plants will yield about two quarts of oil [Piesse]. The plants last only about four years for distillation-purposes. The soil should be calcareous [Vilmorin]. According to Mr. Slater's long experiences at Port Phillip, planting should be effected at the commencement of the cool season, with the prospect of oil to the extent of about 40lb. from an acre becoming available in the first season already, worth now about 56s. per lb. In tropical countries the Lavender likes some shade.

Lavandula latifolia, C. Bauhin. (*L. Spica,* De Candolle.)

South-Europe, North-Africa. This species is the richest yielder of oil. Hardy in Norway to lat. 67° 56′. The Lavenders are easily multiplied by slips. Seeds will keep for five years.

Lavandula Stœchas, Linné.

South-Europe, North-Africa. "Topped Lavender." This shrub can also be utilized for oil-distillation and other pnrposes, for which the two other Lavenders are used. The quality of the oil of these species seems to differ according to their locality of growth. Mr. James Dickinson, of Port Arlington, Victoria, informs us, that this is the best plant known to him for staying sand. It grows much quicker than the Ulex: every seed which falls germinates, so that around each bush every stroke of the spade brings up lots of seedlings fit for transplantation. In mild regions it is five months in full flower annually, coming into bloom early. Bees are passion-

ately fond of the nectar of the flowers. Mr. Dickinson calculates, that a ton of the finest-flavored honey can be obtained annually from an acre of this Lavender.

Lavatera arborea, Linné.

"Tree-Mallow" of the countries on the Mediterranean Sea. A tall biennial, or oftener perennial plant of rapid growth. The ribbon-like bast is produced in greater abundance and more rapidly than in most malvaceous plants, and is recommended for paper-material. Bears frost to 15° F. [Gorlie]. The Tree-Mallow might easily be naturalised on sea-shores, where it would be useful as a quick shelter. Perhaps it might also serve with allied plants for green manure. The bulky foliage has proved valuable for fodder, and so has that of Lavatera plebeja (Sims) of Australia. An other perennial tall species is L. unguiculata (Desfontaines) of South-Europe. The Chinese annual or biennial Althaea rosea (Cavanilles), the Hollyhock, might serve the same purposes.

Lawsonia alba, Lamarck.

North- and Middle-Africa, Arabia, Persia, India and North-Western Australia. The "Henne or Henna-bush." It may become of use as a dye-plant in regions free from frost. The orange pigment is obtained from the ground foliage. Mr. C. B. Clarke considers it one of the best hedge-plants in India, together with Dodonæa viscosa (Linné) and Odina Wodier (Roxburgh). A fragrant essence was distilled from the flowers already by the ancient Egyptians and Israelites [Dr. G. Watt].

Leersia hexandra, Swartz.

Africa, South-Asia, warmer parts of America and Australia. Found by Mr. Bailey to be one of the most relished by cattle among aquatic grasses of East-Australia. In the Philippines regularly cultivated for fodder in the manner of rice. L. Gouini (Fournier) is a Mexican species.

Leersia oryzoides, Solander.

Middle and South-Europe, various parts of Asia, Africa and America. A perenial rather rough swamp-grass. Other Leersias from both hemispheres are deserving of introduction, if even only for the benefit of waterfowl.

Leonotis Leonurus, R. Brown.

South-Africa. The foliage of this highly ornamental bush deserves attention for therapeutic purposes, as, according to Professor McOwen, the leaves, when used like tobacco, are highly stimulative.

Leontice thalictroides, Linné. (*Caulophyllum thalictroides,* Michaux.)

North-America. "Blue Cohosh," or "Pappoose-root." A perennial herb, the root of which is in medicinal use. The resin, extracted from the root, contributes the caulophyllin as an emmenagogue.

Lepidium latifolium, Linné.

Europe, North-Africa, Middle- and North-Asia. A perennial herb, of peppery acridity, used for some select sauces.

Lepidium sativum, Linné.

The "Cress." Orient. Annual. Irrespective of its culinary value, cress is of use as one of the remedies in cases of scurvy. Seeds will keep for several years. Active principle: a volatile oil and the bitter lepidin. The crisp-leaved variety preferentially reared. Seeds a substitute for those of mustard [Wittstein].

Lepidosperma gladiatum, La Billardière.

The Sword-Sedge of the sea-coast of extra-tropical Australia. One of the most important plants for binding sea-sand, also yielding a paper-material as good as Sparta. Mr. Th. Christy has brought the "Cross" process for textile fabrics or paper-pulp recently into use, which consists in treating vegetable fibrous substances under strong pressure (15-30 lb. per square-inch) with water containing about 3 per cent. of Thiolyte.

Lepironia mucronata, Cl. Richard.

East-Australia, Malayan Archipelagus, East-Indies, South-China, Madagascar. This rush is cultivated (like rice) in China for textile purposes, but in poor soils the manure impairs its strength. The plant renews itself by sprouts from its perennial root. It attains a height of 7 feet; the stems are beaten flat, to fit them to be woven or plaited for either bed-mats and bags, or especially for mat-sails, the latter being the most extensively used for the junks in China; further, the plant is utilised for making the floor-matting, which is exported in vast quantities to the United States, to be used in summer for the sake of coolness, in preference to carpets [Dr. Hance]. This rush thus furnishes the raw material for a great manufacturing industry. The dyeing of the mats yellow is effected with the flowers of Sophora Japonica, under addition of alum; green with an acanthaceous plant, the Lam-yip (Blue Leaf), alum and sulphate of copper [Dr. Hirst].

Leptorhabdos Benthamianus, Walpers.

From Thibet to Persia, ascending to 11,000 feet. An annual herb. One of the principal summer-fodders for sheep and goats throughout the Juniper-forests of Beloochistan [J. H. Lace.].

Leptospermum abnorme, F. v. Mueller.

East-Australia, towards the coast. A tree, gaining finally a height of 60 feet, with a stem-diameter to two feet. Wood very hard and heavy. A variety produces fragrant foliage.

Leptospermum lævigatum, F. v. Mueller.* (*Fabricia lævigata*, Gaertner.)

The "Sandstay." Sea-shores and sand-deserts of extra-tropical Australia, but not extending to Western Australia. This shrub or small tree is the most effectual of all for arresting the progress of drift-sand in a warm clime. It is most easily raised by simply scattering the seeds on the sand in autumn and covering them loosely with boughs, or better still by spreading lopped-off branches of the shrub itself, bearing ripe seeds, on the sand.

Leptospermum lanigerum, Smith.

South-Eastern Australia. This tall shrub or small tree can be grown in wet semi-saline soil. It exercises antimalarian influences on such places like Melaleuca ericifolia. The somewhat aromatic leaves of L. scoparium (Forster) were already in Captain Cook's expedition used for an antiscorbutic tea; hence the name "Tea-tree" for this and some allied plants.

Lespedeza striata, Hooker and Arnott.

China and Japan. Sometimes called "Japan-Clover." An annual herb, which in North-America has proved of great use. Professor Meehan states it to be identical with the "Hoop-Koop" plant, and that it has taken possession of much waste land in the Southern States. It grows there wonderfully on the hot dry soil, and the cattle like it amazingly. Mr. Jackson observes, that it spreads on spaces between forest-trees, covering the soil with a dense permanent herbage. Dr. Carl Mohr says, that it stands drought well, and thrives on sandy clay, but luxuriates on light calcareous soil. Carried far about through the egesta of pasture-animals. Forms a turf, hardly suffering from any traffic. It seizes on all sorts of soil with equal facility; subdues weeds. Rich in albuminous contents [Prof. Phares]. Easily dried for hay. Has kept up well also in the sub-tropic regions of Eastern Australia during the summer heat; likes best to grow on moist ground among grasses [J. S. Edgar]. Apt to die down in summer-heat, when most wanted [J. M. Wood]. It is impatient of frost [W. Elliott].

Leucadendron argenteum, Brown.

The Silver-tree of South-Africa is included on this occasion, because it would add to the splendour of our woods, and thrive far better there than in gardens within the warm temperate zone. Moreover, with this tree, many others, equally glorious, might be established in any mild forest-glens as a source of horticultural wealth, were it only to obtain in future years a copious supply of

seeds. Mention may be made of the tall magnolia trees of North-America: Magnolia grandiflora (Linné), 100 feet high; M. umbrella (Lamarck), 40 feet; M. acuminata (Linné), 80 feet; M. cordata (Michaux), 50 feet; M. Fraseri (Walter), 40 feet; M. macrophylla (Michaux), 40 feet; M. Yulan (Desfontaines), of China, 50 feet; M. Campbelli (J. Hooker), of the Himalayas, 150 feet high, with flowers nearly a foot across; M. sphærocarpa (Roxburgh), also of the Indian highlands, 40 feet; Stenocarpus sinuosus (Endlicher), of East-Australia (the most brilliant of the Proteaceæ), the crimson and scarlet Ratas of New Zealand, Metrosideros florida (Smith); M. lucida (Menzies), M. robusta (Cunningham), 80 feet high; M. tomentosa (Cunn.), 40 feet; Fuchsia excorticata (L. fil.), also from New Zealand, stem reaching 2 feet in diameter; Rhododendron Falconerii (J. Hooker), from Upper India, 50 feet high, leaves 18 inches long, not to speak of other gorgeous trees.

Lewisia rediviva, Pursh.

North-Western America. The root of this herb is large and starchy, was formerly extensively used by the native inhabitants, and called by them "The Gift of the Great Spirit." The plant deserves trial-culture.

Leyssera gnaphaloides, Linné.

South-Africa. A perennial herb of aromatic scent and taste. Much used there as a medicinal tea.

Liatris odoratissima, Willdenow.

Southern States of North-America. A perennial herb, occurring in swampy places. The leaves are sometimes used, for the sake of their aromatic odor, to flavor tobacco and other substances [Saunders]. L. spicata (Willdenow) is the "Button-Snakeroot," medicinal in the Eastern States.

Libocedrus Chilensis, Endlicher.

In cold valleys on the Southern Andes of Chili, at from 2,000 to 5,000 feet. A fine tree, sometimes 80 feet high, furnishing a hard, resinous wood of a yellowish colour. Libocedrus as a genus is hardly to be distinguished from Thuya, as pointed out more particularly by Bentham.

Libocedrus decurrens, Torrey.

White Cedar of California, growing on high mountains, in fine groves, up to 9,000 feet, in what Hinchcliff calls the noblest zone of Coniferæ of the globe. Attains a height of fully 200 feet, with a stem to 25 feet in circumference. The wood is light, pale-coloured and soft, yet strong, used for exquisite cabinet-work, but also suitable for superior fence-rails and building purposes. According to Dr. Gibbons, the tree is well adapted for wind-breaks, and can be trained into tall hedges.

Libocedrus Doniana, Endlicher.

Northern Island of New Zealand, up to 6,000 feet elevation. A forest-tree, reaching 100 feet in height, the stem 3 feet and more in diameter. The wood is hard and resinous, of a dark-reddish color, fine-grained, excellent for planks and spars.

Libocedrus tetragona, Endlicher.

On the Andes of Chili, at an elevation of from 2,000 to 5,000 feet, growing as far south as Magellan's Straits, especially in moist moory localities. This species has a very straight stem, and rises to 120 feet. The wood, though soft and light, is resinous, and will resist underground decay for a century and more, like that of Fitzroya Patagonica; for railway-sleepers this timber is locally preferred to any other [Dr. Philippi]; it is also highly esteemed for various artizan's work; it is nearly white.

Ligustrum Japonicum, Thunberg.

The Japan-Privet. A shrub, evergreen or nearly so, promising to become a valuable hedge-plant. Hardy still in Christiania [Schuebeler]. It grows readily from cuttings, like the ordinary European Privet, Ligustrum vulgare (Linné). Both will grow under trees, where scarcely anything else would live [Johnson].

Ligustrum lucidum, Aiton.

China. This evergreen tall bush is inhabited by a wax-insect (Flata limbata) in some parts of China [A. Hosie]. The quantity of wax thus obtained is considerable [Dr. K. Mueller].

Limonia acidissima, Linné.

India, up to 4,000 feet; hardy in England. This shrub or small tree has fruit of extreme acidity, but insignificant in size, which culture may enlarge.

Lindera Benzoin, Blume.

From Canada to the Gulf of Mexico, there called the Spice-Laurel. An aromatic bush, one of the hardiest of the order. The aroma of the foliage much like that of Bay-leaves. L. Neesiana (Bentham) from the Himalaya yields a kind of Sassafras, according to Kurz.

Linum usitatissimum, Linné.*

The Flax-Plant. Orient. Perhaps indigenous also in South-Europe, and probably derived from L. angustifolium (Hudson), which was cultivated in Switzerland already during the stone-age [Heer]. A well-known annual, which yields linen-fibre and linseed-oil. Few plants find a wider congeniality of soil and climate, and few give a quicker return. Good and deep soil, even of forests, well-drained, is best for successful flax-culture. In Norway it is

cultivated as far north as lat. 70° 3′ [Prof. Schuebeler]. The flax belongs to the Potash-plants. Change of seed-grain is desirable. Thick sowing extends the length and flexibility of the fibre. To obtain the best fibre, the plant must be pulled when the seeds commence to ripen. If the seeds are allowed in part to mature, then both fibre and seeds may be turned to account. If the seed is left to ripen completely, the fibre is generally discarded. The seed yields by pressure about 22 per cent. of oil. The residue can either be prepared as linseed-meal or be utilised as admixture to stable-fodder. The demand for both fibre and oil is enormous. Two principal varieties are under culture; a tall sort, with smaller flowers, closed capsules and dark seed; a dwarf sort, more branched (even if closely sown), with larger flowers and capsules, the seed-vessels opening spontaneously and with elasticity, while the seeds are of a pale color None of the perennial species of Linum are so manageable in culture as the ordinary annual Flax. The ordinary steeping method for separating the fibre is now in many places superseded by the so-called dry process through special machinery, resulting in gain of yield and strength. Again, application of steam to the gathered plants, or the use of chemicals have variously been introduced to free the fibre. Great Britain imported in 1884 of Flax 80,000 tons, worth over three million pounds sterling, and of Linseed 1,805,000 quarters, valued at £3,832,000; during 1889 it was: Flax 1,587,422 cwt., valued at £2,837,800; Linseed 2,269,495 quarters, valued at £4,570,203; and yet over 130,000 acres were under home-culture devoted to this plant. In France, during 1885, the area under this crop was 104,715 acres, producing 442,288 cwt. of seeds and 748,028 cwt. of fibre. In Holland, where the returns are most prolific, during 1884, were realised from 26,076 acres as much as 296,252 bushels of seeds, and 107,557 cwt. of fibre. The import into Victoria during 1887 was 5,300 cwt. of Flax, valued £4,879, and Linseed-oil £290,647 gallons, valued £34,397.

Lippia citriodora, Kunth.

Peru, Chili, La Plata-States, Brazil. An evergreen shrub, yielding scented oil, used for condiments and for perfumery as "Verbena." The leaves fit for flavoring tea. L. Mexicana has come into therapeutic use, particularly as an expectorant.

Liquidambar Altingia, Blume.

At the Red Sea and on the mountains of India and New Guinea, ascending to about 3,000 feet. The tree attains a height of 200 feet. It yields the fragrant balsam known as Liquid Storax.

Liquidambar Formosana, Hance.

China. A silk-producing insect is reared on this tree [Hance].

Liquidambar orientalis, Miller (*L. imberbe,* Aiton.)

Asia Minor. This tree also yields Liquid Storax, which is vanilla-scented, containing much styrol and styracin, and thus used for imparting scent to some sorts of tobacco and cigars, also for keeping moths from clothing. Its use in medicine is more limited than in perfumery.

Liquidambar styraciflua, Linné.

The Sweet-Gum tree. In morasses and on the springs of forests of Eastern North-America, with a wide geographic range. Endures severe frosts after the plant has attained considerable size. Succeeds on a great variety of soils [B. E. Fernow]. The ramifications of the tree attain vast dimensions; the stem to about 100 feet in height and to 10 feet in diameter. The wood is reddish-brown, very compact and heavy, fine-grained, durable, easily worked, little liable to warp, and admitting of a fine finish, with its pleasing tint, especially adapted for furniture. The terebinthine juice hardens, on exposure, to a resin of benzoin odor, The bark contains about 8 per cent. tannin. Leaves fragrant, turning crimson in autumn [Asa Gray].

Liriodendron tulipifera, Linné.

The Tulip-tree of North-America. One of the largest trees of the United States, and one of the grandest vegetable productions of the temperate zone. In deep fertile soil and cool valleys it sometimes attains a height of about 140 feet, with a straight clear stem reaching 9 feet in diameter. In Norway it is hardy to lat. 61° 17′ [Schuebeler]. The Tulip-wood is highly esteemed and very extensively used, wherever this tree abounds, uniting lightness with handsomeness. It is of a light-yellow color, fine-grained, compact, easily worked and takes a good polish. It is employed for house-building inside, for bridges, cheap furniture, implements, shingles, pumps, wooden-ware, boat-building, and a variety of other purposes. On account of its uniformity and freedom from knots and its disinclination to warp or shrink, much used in Canada for railway-cars and carriage-building, chiefly for the panelling [Robb]. The bark yields about 8 per cent. tannin. As this tree is difficult to transplant, it should be grown on the spot, where it is to remain. Professor Meehan observes, that it is of quicker growth than the Horse-Chestnuttree and many Maples. In forest-valleys of the colony Victoria plants gained in a few years a height of over 20 feet [Ch. French]. The flowers yield to bees much honey; indeed Mr. Langstroth speaks of the Tulip-tree as one of the greatest honey-producers in the world; as its large flowers expand in succession, new swarms will sometimes fill their hives from this source alone. A variety of this seems to occur as indigenous in China.

Lithospermum canescens, Lehmann.

North-American Alkanet. This, as the vernacular name indicates, offers a dye-root.

Lithospermum hirtum, Lehmann.

North-American Alkanna. A showy perennial herb; the root yields a red dye.

Lithospermum longiflorum, Sprengel.

North-America. A red pigment can also be extracted from the root of this species.

Livistona Australis, Martius.*

East-Australia. The only Palm-tree in Victoria, occurring in East-Gippsland (in the latitude of Melbourne), and there attaining a height of about 80 feet. It endures the winters of South-France to 40° 32′ north lat. [Naudin]. The young leaves can be plaited as a material for cabbage-tree hats. The seeds (of which about 200 are contained in one pound) retain their vitality far better than those of the Australian Ptychospermas. This palm can be transferred from its native haunts to very long distances for growth, by previously separating the main portion of the root from the soil, and leaving the plant for some months on the original spot, so as to remove it finally with new rootlets, retaining much soil. Some of the Indian Livistonas may be equally hardy; their stems often tower above the other forest-trees.

Livistona Chinensis, R. Brown.

South-China and Japan. A very decorative Fan-palm, and one of the hardiest of the whole order. In its native country, the hairy stem-covering of this palm is used for fixing lime-plaster to buildings [Christie].

Livistona Leichhardtii, F. v. Mueller.

North-Australia. Under this name might be combined L. inermis and L. humilis (R. Brown), neither name applying well to this finally tall palm with thorny leaf-stalks. The author of this work as well as Dr. Leichhardt saw it far inland in dry open not mountainous regions also; nevertheless it may need a moister clime than the following species.

Livistona Mariæ, F. v. Mueller.

Central and West-Australia, barely within the tropics. This noble Fan-palm attains 40 feet in height, and is likely to prove more hardy than many others. Young foliage copper-colored.

Lolium perenne, Linné.*

Europe, North-Africa, Western Asia. The perennial Rye-grass, one of the best known of all utilitarian grasses. In Norway it

grows to lat. 65° 28′ [Schuebeler], and extends naturally to Shetland [Sir J. Hooker]. One of the most important of all pasture-grasses, also almost universally chosen for lawn-culture. It produces an abundance of seeds, which are readily collected and easily vegetate. It comes early to perfection, and shoots quickly again after it has been cut. Nevertheless the productive and nutritive powers are considerably less than those of Dactylis glomerata, Alopecurus pratensis and Festuca elatior, but it pushes forward earlier than the last-mentioned grass, while the ripening of seeds is less defective than in Alopecurus. The chemical analysis, made very early in spring, gave the following results:—Albumen, 3·36; gluten, 4·88; starch, 0·51; gum, 1·80; sugar, 1·80 per cent. [F. v. Mueller and L. Rummel]. At the London Sewerage-Depot, 60 tons of rye-grass were obtained from one acre [McIvor]. Rye-grass, though naturally living but a few years, maintains its ground well, by the ease with which it disseminates itself spontaneously. Several sorts, which can scarcely be called varieties, are under cultivation. Rye-grass stands the dry heat of Australian summers fairly well. It is likely to spread gradually over the whole of the Australian continent, and to play an important part in pasture, except the hottest desert-tracts. Sheep should not be continually be kept on rye-grass pasture, as they may become subject to fits similar to those produced by L. temulentum, possibly due to the grass getting ergotised or otherwise diseased, as many observers assert. It is one of the best grasses, to endure traffic on roads or paths, particularly on soil not altogether light, and is also one of the few among important grasses, which can be sown at any season in mild climes. The Italian rye-grass is a mere variety, but preferably chosen as an early temporary shelter for tenderer but more lasting pasture-grasses, also furnishing a good collateral return the first season. It is also an excellent grass for irrigation, especially on lighter soils. For permanent pastures the proportion should not be too large, because through its vigor it may suppress other grasses, but is apt to die out in two or three years. The best crop is in the second year [Dr. Stebler]. Ordinary rye-grass can be cut several times in a season.

Lotus corniculatus, Linné.

"Bird's-foot-Trefoil." Europe, North-Africa, Northern and Middle Asia, extra-tropical Australia. Indigenous in Norway as far north as lat. 69° 58′ [Schuebeler]. A deep-rooting perennial herb, readily growing on pasture-land, sandy links and heathy places. This plant is well deserving cultivation on light inferior soil, on which it will yield a greater bulk of herbage than any of the other cultivated clovers; it is highly nutritious, and is eaten with avidity by cattle and sheep. From the great depth, to which its roots penetrate, it is not liable to be injured by drought. It well fills out vacant places between higher fodder-herbs on meadows; it is always somewhat saline, and welcome in hay.

Most recommendable for mixture in pasturage. L. tenuis (Kitaibel) is a valuable variety of the coasts. The nearly allied L. major (Scopoli) and L. uliginosus (Schkuhr) yield a still greater amount of herbage; they are particularly suited for bushy and moist localities, and attain their greatest luxuriance on soils, which have some peat in their composition [Lawson]. In Australia Lotus corniculatus shows a decided predilection for wet meadows.

Lotus tetragonolobus, Linné.

Countries on the Mediterranean Sea. Though annual, this herb is highly valued for sheep-pastures. The green pods serve even as a culinary vegetable. The allied L. siliquosus (Linné) is perennial, and occurs in a succulent form on sea-coasts. The seeds will retain their vitality for several years.

Loxopterygium Lorentzii, Grisebach.

La Plata-States. The bark and wood, called Quebracho colorado, extensively used for tanning; latterly much exported to Europe. The length of time for the tanning process with this bark is only half that for oak-bark. The kino of this tree has come into therapeutic use.

Lupinus albus, Linné.

The White Lupine. Countries on the Mediterranean Sea, also in the Orient. An annual quick-growing herb, valuable when young for fodder, and also for green manure. In Norway it will grow to lat. 70° 22′ north [Schuebeler]. It is famed as the "Tramoso" in Portugal, to suppress sorrel and other obstinate weeds by its close and easy growth. The lentil-like seeds, after the bitter principle (lupinin) has been removed through boiling or soaking in salt-water, are edible. It would lead too far, to enumerate here many others of the numerous species of lupines, of which unquestionably very many are eligible for agrarian purposes, while all are acceptable as hardy, elegant and easily grown garden-plants. One, L. perennis, L., extends in America to the Northern States of the Union and Canada; fourteen are recorded from South-Europe. seventeen from Brazil, and numerous species from other parts of America, where the limits of the genus are about Monte Video southward and about Nootka-Sound northward. The majority of the species are perennial. The Egyptian L. Termis (Forskael) and L. Græcus (Boissier) are closely allied to L. albus, and of equal use; their flowers are bluish or blue.

Lupinus angustifolius, Linné.

Countries on the Mediterranean Sea. An annual blue-flowered species, preferable to L. luteus for grain-harvest. Hardy to lat. 70° in Norway. Some if not all lupines can be counted among honey-plants.

Lupinus arboreus, Sims.*

California. This has been used there for reclamation on sand, on account of its long tap-roots, the latter having been traced to a depth of 25 feet, while the stems were only 3 feet high. The germination is easy and the growth rapid on the sand-dunes. For aiding the young lupines during the first two months, to get hold of the sand, barley is sown with them, as the latter sprouts in a few days and holds the sand in the second week; the lupine subsequently covers the sand with a dense vegetation in less than a year.

Lupinus Douglasii, Agardh.

Oregon and California. Hardy in Norway to lat. 67° 56'. This somewhat woody species can be used for binding sand with L. Chamissonis, Escholtz (L. albifrons, Bentham) and many perennial lupines from other countries.

Lupinus luteus, Linné.*

The Scented Yellow Lupine. Countries in the vicinity of the Mediterranean Sea. Can be grown in Norway to lat. 70° [Schuebeler], This annual species is predominantly in use as green manure through Middle Europe, to improve sandy soil; it is the best of all yet tested, and will do even on coast-drifts. It can also be employed like some other lupines as a fodder-herb, green as well as for hay; some lupines are also very valuable as pasture-herbs. Lupin-seeds are very fattening, when used as an addition to ordinary fodder, and are in this respect quite equal to oil-cake, while the foliage is said to be not inferior to that of clover and more bulky. Nevertheless some lupines have proved poisonous to sheep. About 90 lbs. of seeds are required for an acre. Langethal observes: "What the Sainfoin does for the poorest limestone or marly soil, that the Yellow Lupine carries out for sand-land." Lupines are not adapted for wet or moory ground, nor for limestone-formations, where most other leguminous fodder-plants do well. Mr. Joseph Augustin speaks of a yellow-flowering lupine, which sometimes in the Azores attains a height of 12 feet in three months.

Lupinus varius, Linné.

The Blue Lupine. Also a Mediterranean annual, used like the above species; but a few others are under cultivation as Blue Lupines. Some of the American, particularly Californian species, are regarded even as superior to the Mediterranean kinds for agrarian purposes.

Lycium Afrum, Linné.

Africa and South-Western Asia. "The Caffir-Thorn." Can with many other species be utilized as a hedge-bush. It is almost evergreen, fiercely spiny, easily raised from seeds, readily trans-

planted, quick in growth, stands clipping well, seeds freely, is strong enough to resist cattle and close enough to keep off fowls. Succeeds famously even on coast-sands. A first-rate bee-plant [J. Bolton]. 1½ lb. of seeds at a cost of 30 shillings suffices for a mile of hedging [Th. Lang]. Pasture-animals must be kept away from the foliage, which is deleterious. L. Chinense (Miller) and some few other congeners serve likewise hedge-purposes.

Lycium barbarum, Linné.

Northern Africa and South-Western Asia. The most common kind grown in Europe for hedges. Is content with poor soil.

Lycium Europæum, Linné.

Countries around the Mediterranean Sea. "The Box-Thorn." Hardy in Norway to lat. 67° 56′. An excellent hedge-plant, particularly in sand-land, but emitting copious offshoots [C. Bouché]. An allied congener is L. flaccidum (Moench).

Lycoperdon giganteum, Batsch.

Europe, Asia. When young this and many other kinds of puff-balls can be converted into wholesome food. They have when ripe hæmastatic properties, and are further particularly valuable for dressing the back-sores of horses; even for treating carcinomatous ulcers these particular fungs have proved highly valuable.

Lycopodium dendroideum, Michaux.

Eastern North-America. This, with L. lucidulum, has become there a great article of trade, being in request for bouquets and wreaths; both plants, after having been dyed of various colors, are used as ornaments in vases [Meehan]. These club-mosses are mentioned here, to draw attention to similar species in other countries.

Lygeum Spartum, Linné.

Regions on the Mediterrannean Sea. This perrenial grass serves much like the ordinary Esparto-Grass, but is inferior to it.

Lyperia crocea, Ecklon.

South-Africa. The flowers of this shrub produce a fine orange dye, and are also in use for medicinal purposes,

Maba geminata, R. Brown.

One of the Ebony-trees in Queensland. Wood, according to M. Thozet, black towards the centre, bright-red towards the bark, close-grained, hard, heavy, elastic and tough. It takes a high polish, and is recommended for veneers. Maba fasciculosa (F. v. M.) has the outer wood white and pink. Several other species exist in Queensland, which may perhaps give good substitutes for Ebony-wood.

Macadamia ternifolia, F. v. Mueller.

The Nut-tree of sub-tropical Eastern Australia, attaining a heigth of 60 feet; hardy as far south as Melbourne; in forest-valleys probably of fair celerity of growth; endures slight frost. In favorable localities it bears fruit in seven years. The nuts have the taste of hazels. Thrives well at 5,000 feet elevation in Java [Dr. Treub].

Machilus odoratissima, Nees.

The "Soom-tree." From the Himalayas to Assam, Cochin-China, Burmah, Java and Sumatra, ascending to the cool elevation of 8,000 feet. A tree of considerable size. The Muga-Silkworm feeds on the foliage [Gamble]. The leaves are pervaded by an orange-scent [Brandis].

Maclura aurantiaca, Nuttall.*

The Osage-Orange, or North-American Bow-Wood, or Yellow Wood. Texas, Arkansas, Louisiana. This thorny deciduous shrub or tree can be well trained into hedges. It is unisexual, and will in favorable localities on rich river-banks attain a height of 60 feet, with a stem two to three feet thick, thus becoming available as a timber-tree. It resists severe frosts. Rate of stem-growth in Nebraska about 1 inch a year circumferentially [Furnas]. The saplings furnish stakes for vines, which are very lasting. The elastic wood serves well for bows, buggy-shafts, carriage-poles and similar articles. It is one of the most durable of all North-American woods, also valuable for all purposes, where toughness and elasticity are required [Dr. C. Mohr]. The plant is not readily subject to blight or attacks of insects. It produces from the root a yellow dye. Mrs. Timbrell, at the suggestion of the author, has here shown, that the foliage is as good a food for silk-worms as that of the white mulberry, and the silk produced in no way inferior to ordinary silk. Leaves not too succulent are preferable. [Cf. also Riley, publications of the United States Department of Agriculture 1877].

Maclura excelsa, Planchon.

West-Africa, on mountains up to 3,000 feet elevation. Height of tree often 150 feet. The wood is remarkably durable and tough, beautifully dark-brown and streaked. Birds feed on the fruit.

Maclura Mora, Grisebach.

North-Argentina. A high tree. Wood greatly esteemed for its density and toughness; fruit edible [Dr. Lorentz].

Maclura tinctoria, D. Don.

Central and Southern America. This tree yields the Fustic-wood. Cultivated in Jamaica up to 3000 feet [W. Fawcett].

Magnolia hypoleuca, Siebold.

Japan. A stately tree, with very large and whorled leaves. Trunk to a foot in diameter. Wood remarkably flexible; used for many kinds of utensils. Worthy of introduction as a magnificent garden-object [Christy].

Magnolia macrophylla, Michaux.

Eastern States of North-America. Although not cultivated for any special purposes of the arts or of technics, yet this tree is admitted into this list as one of the grandest of its kind, as well in foliage as flowers. It attains a height of about 60 feet; its leaves are from 1 to $3\frac{1}{2}$ feet long, while its flowers attain a diameter of fully 1 foot. M. grandiflora, L., attains a height of 100 feet, and a stem diameter of 3 feet on the Mississippi; it bears the winter of Philadelphia. M. acuminata, L. and M. Fraseri, Walter, are also large trees. M. acuminata is particularly adapted for street-planting, as it will live in the smoky air of cities. The flowers of all exude much honey-nectar for bees. They ought also to be valuable for perfumeries.

Maharanga Emodi, A. de Candolle.

Nepal. The root produces, like that of Alkanna tinctoria, a red dye.

Malachra capitata, Linné.

Tropical America. A tall herb, annual, or of more than one year's duration. Its fibre is obtainable to lengths of 9 feet; it is of a silky lustre, and equal in technical value to Jute [O'Connor].

Mallotus Philippinensis, J. Mueller. (*Rottlera tinctoria,* Roxburgh.)

South-Asia and East-Australia, in jungle-country, extending into New South Wales. A bush or tree, attaining, according to Mr. O'Shanesy, a height of about 60 feet. Though not of great importance, this plant should not be passed on this occasion, inasmuch as the powdery substance, investing the seed-capsules, constitutes the Kamala, which can be employed not only as an orange-dye, but also as an anthelmintic remedy. The Hindoo silk-dyers produce the color by boiling the Kamala with carbonate of soda.

Malva crispa, Linné.

Indigenous probably to South-Western Asia. A tall annual herb. The curled leaves are used extensively in France for dressing desserts, for which purpose the plant is especially grown [Vilmorin].

Mammea Americana, Linné.

Tropical America. This tree is cultivated in Jamaica up to 3000 feet [Fawcett]. Fruit large; the pulp, except the most outer and most inner, edible.

Mangifera Indica, Linné.*

The Mango. South-Asia. An evergreen very shady tree, reaching 70 feet in height. Can be made to bear its delicious fruit in warm and humid forest-regions to sub-tropic zones. In the Himalayas its culture for fruit ascends to 3,500 feet just outside the tropics. At Port Curtis, barely within the tropics, it bears copiously [Edgar]. Mango-fruits are now already candied in Queensland [Prof. Shelton], there also made into jelly and marmalade. Mr. W. Kelleway succeeded in fruiting the Mango even as far south as the Richmond-River, the trees from seeds coming there into bearing within five years. At Bangalore Mangoes up to the weight of 3 lbs. have been obtained.

Maoutia Puya, Weddell.

India, on mountains up to 4,000 feet. It is taller than Boehmeria nivea, and furnishes a similar fibre, which however is not so easily separated. This shrub belongs to a tribe of the Nettle-order not possessing burning acridity. None of the true nettles, such as the Girardinias, nor allied stinging plants, have been recommended in this index, although an exquisite fibre is derived from some, as the writer wishes to guard against the introduction of any burning species, which might possibly become disseminated in a mischievous manner, and then probably could not again be suppressed.

Manihot Aipi, Pohl.*

The Sweet Cassava. Tropical South-America, but traced as far south as the Parana-River. The root is reddish and harmless; it can therefore be used as a culinary esculent, without any preparation further than boiling, while its starch is also available for tapioca; it attains exceptionally a length of 2 feet. It is a somewhat woody plant, several feet high, and too important to be left altogether unnoticed on this occasion, although we have no evidence that it will be productive in a temperate clime. Aipi has ligneous tough fibres, stretching along the axis of the tubers, while generally the roots of M. utilissima are free from this central woody substance. Both are thriving as far south as Moreton-Bay.

Manihot Glaziovi, J. Mueller.*

A native of Ceara, a coast-district of Brazil, in latitude 4°, possessing a climate arid for a considerable part of the year. This tree is evidently of a comparatively hardy character, and adapts itself readily to the exigencies of culture [D. Morris]. Thrives well as far south as Durban in Natal [J. M. Wood] and Moreton-

Bay (Fred. Turner). It produces the Ceara-Rubber. Its cultivation is not difficult, and its growth remarkably rapid. It could only be grown in regions free of frost. Mr. Holtze, at Port Darwin, had the first grand success with this plant in Australia, seeds from Kew-Gardens having been placed by the author at his disposal; his plants attained a height of 12 feet in little more than a year. Perhaps the plant must be regarded as strictly tropical, and as then not admissable within the scope of this work. Still near Port Curtis, at the verge of the tropics, it grows fast and matures seeds; the trees there already are over 20 feet high [Edgar]. In Ceylon it thrives well up to 3,000 feet elevation, content with poor dry soil [Dr. Trimen]. Easily reared from seeds or propagated from cuttings; the germinating is expedited by filing the shell of the seeds and placing them in coir; when sprouting they should be put into the soil with the germ downward. In Ceylon the plant has grown as much as 20–30 feet in two years; the plants should be placed about 10 feet apart. It is best to wait with tapping till the trees are five years old [Keir Leitch].

Manihot utilissima, Pohl.*

The Bitter Cassava or Tapioca-Plant. Eastern Brazil. Closely allied to M. Aipi, producing varieties with roots of poisonous acridity and with roots perfectly harmless. The tubers attain a length of 3 feet and a weight of 30 lbs. Exceptionally 100 lbs. of Cassava-roots are obtained from a single stock. They can be converted into bread or cakes, the volatile poison of the milky sap being removed through pressing the grated root in first instance, the remaining acridity being expelled by heat. The starch, heated in a moist state, furnishes tapioca. Manihot is abundantly cultivated in many places, thus at Caraccas, where the singularly uniform temperature throughout the year is only 60° to 70° F. In Jamaica cultivated up to 4,000 feet [W. Fawcett]. Thrives well even in the vicissitudinous clime of Central Australia. Both sorts of Cassava are also quite suited for the sub-tropic country towards Port Curtis, where the severest drought has very little effect on them, good tapioca being made already in the district [Edgar]. Exceeds in productiveness even the Sweet Potato. The roots can be left in the ground till required, and they thus continue to grow. One-fourth of their substance is starch, which is one of the best for cookery. It is a very exhausting crop, and thus stands in need of rich soil and copious manuring. The propagation is effected by cuttings from the ligneous part of the stem. The soil, destined for Cassava, must not be wet. In warm countries the tubers are available in about eight months, though they still continue to grow afterwards. The growth of the plant upward is checked by breaking off the tops. The Bitter Cassava is the more productive of the two. The yellowish tubers do not become soft by boiling, like Aipi.

Maranta arundinacea, Linné.

The True Arrowroot-Plant, or more correctly "Aru-root," inasmuch as Aru-Aru is the Brazilian word for flour, according to Martius. West-Indies, Florida, Mexico to Brazil. The plant is introduced into this list not without hesitation, as it seems to require a tropical clime to attain perfection. The annual mean temperature of 65° F. suffices for this plant [Morris]. It is cultivated up to 3,000 feet in Jamaica according to Mr. Fawcett. It furnishes most of the West-Indian arrowroot-starch, although other species. such as M. nobilis, M. Allouya and M. ramosissima, are also cultivated for a similar starch contained in their tubers. Dr. Porcher observes, that it still flourishes as far north as Florida, producing even in the pine-lands from 200 to 300 bushels of tubers to the acre. General Sir John Lefroy found in Bermuda 100 lbs. of the root to yield 15 to 20 lbs. starch. M. Indica (Tussac) is merely a variety.

Marliera glomerata, Bentham. *(Rubachia glomerata,* Berg.)

The "Cambuca" of sub-tropical Brazil. The fruits attain the size of apricots, and are locally much used for food [Dr. Rosenthal].

Marliera tomentosa, Cambessedes.

Extra-tropical Brazil. The "Guaparanga." The sweet berries of this tall shrub are of the size of cherries.

Marrubium vulgare, L'Ecluse.

Middle and South-Europe, Northern Africa, Western Asia. The "Horehound." This tall perennial odorous herb, though in many countries quite a weed, is here also enumerated for completeness' sake. Its naturalisation can nowhere be unwelcome, as it does not unduly spread, as it has important medicinal properties much dependent on the crystalline Marrubin, and as the flowers through much of the season afford to bees nectar for a pale excellent honey. The plant accomodates itself readily to any forlorn waste land. M. Alyssum (Linné), M. apulum (Tenore) and M. Pannoncium (l'Ecluse) are also apiarian plants [D. Savastano].

Matricaria Chamomilla, Linné.

The annual "Chamomile." Europe, Northern and Middle Asia. A highly useful herb in medicine. In many parts of the European continent it is much more extensively employed than the ordinary perennial Chamomile. The infusion of the flowers has rather a pleasant taste without bitterness. The flowers serve as a tonic, and especially as a sudorific, and possess a peculiar volatile oil. In Norway this plant is grown as far north as lat. 70° 22 [Schuebeler]. In Portugal planted under fruit-trees for insecticidal purposes.

Matricaria glabrata, De Candolle.

The South-African Chamomile. This annual herb is there in renown as an excellent substitute for the European Chamomile [Dr. Pappe]. Several congeners exist there.

Mauritia flexuosa, Linné.

From Guiana to Peru and Brazil. This noble Palm is known to ascend up to 4,000 feet along the Essequibo. As Palms, like Bamboos, prove to be among the hardier of tropical plants, experiments for naturalising M. vinifera (Martius) might also be instituted. This attains a height of about 150 feet, has leaves sometimes 15 feet in length, and yields from the incised stem a copious sap, which forms a kind of wine by fermentation.

Maytenus Boaria, Molina. (*Boaria Molinæ,* De Candolle; *Maytenus Chilensis,* De Candolle).

Chili. An evergreen tree, assuming considerable dimensions in the southern provinces. Wood extremely hard. Cattle and sheep browse with predilection on the foliage; hence the trees are cut down, when grasses become scarce through protracted snowfalls or in times of drought [Dr. Philippi].

Medicago arborea, Linné.

South-Europe, particularly Greece. This shrubby yellow Lucerne is of value for dairy-farmers, as it much promotes in cows the yield of milk. This genus includes several other species, valued as pasture-plants besides the present and those noted below.

Medicago lupulina, Linné.

The Black Medick. Europe, North-Africa and temperate Asia. An annual or biennial pasture-herb, easily grown, and not without nutritive importance. Langethal observes: "It effects for argillaceous soils, what the White Clover does for sandy moist soils. It will even succeed in moory ground, provided such contains some lime. It suits also particularly for sheep-pastures." It will thrive, where on account of poor soil lucerne and clover fail. In rich land its product is very copious. In Norway it will grow to lat. 63° 26.'

Medicago sativa, Morison.*

The Lucerne, Purple Medick or Alfalfa. Orient and temperate Western Asia, now spread through Middle and Southern Europe and Middle Asia. The Romans brought it 470 years before the Christian era from Media, hence the generic name [A. de Candolle]. A perennial fodder-herb of great importance, and largely utilised in most countries with a temperate clime; perhaps descended from the European and North-Asiatic Medicago falcata (Linné), the Yellow Medick, which also deserves naturalisation, especially on light or sandy calcareous soil; but that plant is less productive than the true Lucerne, and does not resist occasional slight

inundations so well, enduring however a rougher clime. Lucerne keeps green and fresh in the hottest season of the year, even in dry and comparatively barren ground and on coast-sands, but develops itself for field-culture with the greatest vigor on river-banks or when subjected to a judicious system of irrigation, particularly in soil rich in lime. Its deeply penetrating roots render the plant particularly fit for fixing embankments or hindering the washing away of soil subject to occasional inundations. Bonnet records a root 66 feet long. The greatest yield is from the second to the sixth year. One of the most valuable of green fodders, but less suited for hay, as the leaves so readily drop off [Dr. Stebler]. Will succeed also in warm climes. The Royal Commission for Water-Supply in New South Wales has ascertained, that ten acres of Lucerne, raised by irrigation for ensilage, would provide for the herd of 2,000 acres pasture-land during a season of drought. The Peruvian variety (Alfalfa) resists drought and frost better than the original European Lucerne. Dr. Curl, of New Zealand, allows cattle to feed upon Alfalfa for two weeks, then takes them off and puts sheep on for two weeks, to eat the Alfalfa close to the ground; he then removes them and permits the Alfalfa to grow for a month, when he repeats the process. He allows five large cattle or twenty sheep to the acre. Lucerne is also an important honey-plant for bees. Much iron in the soil or stagnant-water is detrimental to lucerne-culture, while friable warm soil much promotes its growth. Langethal records instances of lucerne having yielded on the same field under favorable circumstances for fifteen years four or five cuts annually. The chemical analysis of the fresh herb, collected very early in spring, gave the following results: Starch 1·5, gum 2·1, unfermentable sugar 3, albumen 2·3, insoluble proteins 2·3, ash 2·3 per cent. [F. v. Mueller and L. Rummel]. For sandy tracts a yellow variety (M. media, Persoon) deserves preference. To show how enormously plants are affected in their mineral constituents by difference of soil, Lace has analysed the ashes of lucerne (*a*) from granitic soil, (*b*) chalky soil with flints, (*c*) clayey with chalk, (*d*) very chalky, and found—

	a	*b*	*c*	*d*
	Per cent.	Per cent.	Per cent.	Per cent.
Silicic acid	·99	·41	·47	·58
Ferric oxide	·76	1·05	·29	·60
Magnesium carbonate	9·89	7·15	10·11	9·05
Calcium sulphate	4·50	3·04	7·51	6·80
,, phosphate	14·94	8·11	10·66	19·71
,, carbonate	13·42	48·15	49·68	30·19
Potassium carbonate	48·42	29·19	20·60	26·09
Potassium and sodium chlorides ...	6·67	2·90	·68	6·98

Medicago scutellata, J. Bauhin.*

Countries at and near the Mediterranean Sea, where this annual herb, as well as the allied M. orbicularis (Allioni), is regarded as a valuable fodder-plant [Caruel], without the disadvantage of their fruits adhering to fleeces like those of prickly-fruited congeners. For this particulalar reason the author introduced these two plants into Australia, where in the dry hot inland-regions they have surpassed most other fodder-herbs in value and resistance to drought, and wherever these get naturalised, they become a great boon to pasture-lands; in the moist season they afford herbage; in the dry season sheep and other pasture-animals will resort to the copiously shed fruits scattered on the ground. Both will also bear some frost, and are rurally known as kinds of "Snail-Clovers."

Melaleuca ericifolia, Smith.*

South Eastern Australia. A tall shrub or bushy tree. It spreads to a length of 3 feet, sometimes rising to 40 feet. It is of importance for consolidating muddy shores; it will live in salty ground and water, almost like mangroves. I found it growing vigorously, where the water contained rather more than 2 per cent. chlorides, and the wet soil contained nearly $1\frac{1}{2}$ per cent. chlorides (the contents of sea-water being from 3 to 4 per cent. chlorides, or about $2\frac{1}{2}$ per cent. chloride of natrium). It yields also a comparatively large quantity of cajaput-oil. It admits of easy transplantation, even when full-grown. Myoporum insulare (R. Brown) and Leptospermum lanigerum (Aiton) can in like manner be used in tree-plantations for the sake of shelter on wet saline soil. The branches of M. ericifolia furnish the best native material in South-Eastern Australia for easily worked and lasting garlands. This species can be grown in swamps for hygienic purposes by subduing paludal malaria or fever-provoking effluvia. Growth to 26 feet height in nine years.

Melaleuca genistifolia, Smith.

Northern and Eastern Australia. A tree, attaining 40 feet in height, flowering in a shrubby state already, fond of banks of water-courses. The copious flowers, according to Mr. C. French, attract bees to an extraordinary degree.

Melaleuca Leucadendron, Linné.

The Cajaput-tree of India, North- and East-Australia as far extra-tropical as 34° south latitude. Perhaps amenable to gradual acclimitation; in Australia it will bear slight frost. This tree attains a height of about 80 feet, with a stem reaching 4 feet in diameter, on tidal ground; it can with great advantage be utilized on such areas and in salt-swamps for subduing malarian vapors, where no Eucalyptus will live. The lamellar bark protects it against conflagrations. The wood is fissile, hard and close-grained,

regarded as almost imperishable underground, and resists the attacks of termites. It is well adapted for posts, wharf-piles, ship-building and various artisan's work. The foliage yields the well-known Cajaput-oil, so closely akin to Eucalyptus-oil. Mr. K. Staiger obtained on distilling the leaves as much as 2 per cent. of oil. The allied Callistemons (C. salignus, D.C., 60 feet high, C. lanceolatus, D.C., 40 feet) produce a hard, heavy, close-grained wood, suitable for wheelwrights' work and implements, proving very durable underground [W. Hill].

Melaleuca linarifolia, Smith.

Eastern Australia. A tree, attaining finally a considerable height, deserving attention as eligible for wet saline land, on which it can be raised much more easily than Myoporum insulare. M. Thozet observes, that it occurs in places, where it is bathed by the tides; also that large saplings without roots can be transplanted. Thus it may be destined to aid, with several of its congeners and with Salicornias, Avicennias, Ægiceras, Batis, Suaedas and some other plants, to reclaim low muddy shore-lands from sea-floods. Foliage extremely rich in volatile antiseptic oil. M. squarrosa (Smith) of South-Eastern Australia, can be grown in fresh-water swamps, also to subdue miasmata. It attains exceptionally the height of 60 feet, with a stem two feet in diameter.

Melaleuca parviflora, Lindley.

Extra-tropical Australia. A tall bush or small tree. In mild climes one of the most important plants for fixing moving coast-sands.

Melaleuca styphelioides, Smith.

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East-Australia. Height of tree reaching about 60 feet; stem-diameter $2\frac{1}{2}$ feet. The timber is hard, close-grained, and stands well in damp situations. It is said, that the timber has never been known to decay [Queensland Exhibition, 1878]. Tree adapted for swamps.

Melanorrhœa usitata, Wallich.

The Varnish-tree of Burmah, Munnipore and Tenasserim. Possibly hardy in forest-valleys free of frost, as it ascends to 3,000 feet elevation. The hardened sap is used for a highly prized black varnish.

Melia Azadirachta, Linné. (*Azadirachta Indica,* Jussieu).

From Persia to China, ascending the Himalayas to 5,000 feet. The "Neem-tree," attains a height of 50 feet, much planted on promenades. Grew in Natal 20 feet in 5 years [J. M. Wood]. The powerful medicinal properties not unlike those of M. Azedarach. Furniture from its wood not attacked by insects. Leaves simply pinnate, the fresh ones issuing before the older drop.

Melia Azedarach, Linné.

Called "The Pride of India." South-Asia, North- and also East-Australia, and there to far extra-tropical latitudes, ascending the Himalayas to 6,000 feet. Height seldom over 40 feet; branches very spreading. The variety umbraculiformis is particularly shady. As an avenue-tree not without importance, because it will successfully cope with dryness of clime and sterility of soil. It will grow, while young, at the rate of 12 feet a year, if regularly watered, against 6 feet of growth of Grevillia robusta and Schinus Molle, and against only 2 feet of Brachychiton populneus [F. M. Mackey]. It recommends itself also for retaining the foliage till very late in the season without shrivelling, and for producing early an abundance of very fragrant spring-flowers, which may perhaps be worth distilling for essential oil. Grows from cuttings as well as seeds, the latter abundantly maturing. All parts of the plant are bitter; the bark with caution can be used as a purgative and anthelmintic; the leaves prove insecticidal [Hieronymus]. The wood is comparatively soft, light and considered of value for cabinet-work, also some kinds of musical instruments. A black-fruited Melia seems as yet little known. Casimir De Candolle distinguishes twelve species, their range being from India to Japan and Polynesia.

Melianthus major, Linné.

South-Africa. The leaves of this stately plant are very efficacious as antiseptics, also in cases of scald-head, ringworm and various other cutaneous diseases [Dr. Pappe]. Its effect of promoting granulation is very remarkable [Dr. A. Brown]. Flowers rich in honey, as indicated by the generic name. Will bear some frost.

Melica altissima, Linné.

Eastern Europe, Middle Asia. This perennial grass has recently come into use for pasture.

Melica ciliata, Linné.

Europe and Middle Asia. A perennial fodder-grass, particularly desirable for sheep. Best for dry gypsum- or lime-ground.

Melica nutans, Linné.

The Pearl-Grass. Europe, Northern and Middle Asia, enduring an alpine exposure and living also in the shade of forests. It will bear the clime of Norway to lat. 70° 28′ [Schuebeler]. It produces suckers, and affords good foliage in woody regions; so also does M. uniflora (Retzius). Several other species are on record from various parts of the globe, among which M. mutica (Walter), of North-America, seems to deserve special attention.

Melica sarmentosa, Nees.

Brazil and La Plata-States. A tall grass, climbing to a height of 12 feet in forests and on river-banks. Professor Hieronymus speaks of M. aurantiaca (Desrousseaux), M. laxiflora (Cavanilles), M. macra (Nees), M. papilionacea (Linné), M. rigida and M. violacea (Cavanilles) as perennial Pampas-grasses, which though hard, are nutritious, and particularly sought by asses and mules.

Melicocca bijuga, Linné.

The Jenip. Central America, on mountains. Cultivated in Jamaica up to about 3000 feet [W. Fawcett]. So many sapindaceous trees of the Cupania-series have been shown by my own experiments to be hardy in a climate like that of Victoria, that this important member of the series could now also be admitted into this list. The pulp of the fruit is of a grape-taste; the seeds can be used like sweet chestnuts.

Melilotus alba, Desrousseaux.

The Cabul- or Bokhara-clover. Europe, North-Africa, Middle Asia. Indigenous in Norway to lat. 50° 16′ [Schuebeler]. A biennial herb. On account of its fragrance it is of some value as admixture to hay. Pigs devour this herb with avidity [Vasey]. It is also a good bee-plant, the white flowers lasting till late in the season. Odorous principle: cumarin. The species of Melilotus are regarded by Mr. W. Farrer as among the best for green manuring.

Melilotus altissima, Thuillier. (*M. officinalis,* Desrousseaux.)

Europe and Middle Asia. In Norway hardy to lat. 76° 17′. Biennial or lasting through several years, if prevented from flowering. Contains also Cumarin. Allied species are M. macrorrhiza (Persoon) and M. parviflora (Desrousseaux). All serve purposes similar to those for which M. alba is employed. Grown on the coast it becomes less odorous. Honey from this and closely allied plants exquisite. Imparts its scent to milk and butter disadvantageously.

Melilotus cœrulea, Gaertner.

South-Europe and North-Africa. Cultivated in Norway to lat. 70° 22′. An annual, very odorous fodder-herb. It forms an ingredient of the green Swiss cheese, which owes its flavor and color chiefly to this plant.

Melissa officinalis, Linné.

The Balm-Herb. Southern Europe and Western Asia. A perennial herb, valuable for its scent, which depends on a peculiar volatile oil. This herb is also important as a bee-plant. Readily *propagated* by division of the root.

Melocalamus compactiflorus, Bentham.

Martaban, ascending to 6,000 feet. This Bamboo attains a height of 25 feet, and is somewhat scandent.

Melocanna bambusoides, Trinius.

The Berry-bearing Bamboo, from Chittagong and other mountainous parts of India, as well as of the Archipelagus. Height to 70 feet [Kurz]. The fruit is of the size of a small pear, fleshy, and contains a seed, which is said to be very pleasant eating [Masters]. It is a thornless Bamboo, growing on dry slopes of hills. Circumference towards base 1 foot; growth beautifully erect.

Mentha arvensis, Linné.

Europe, extra-tropical Asia. The variety piperascens of this perennial herb constitutes the peculiar Japan-Peppermint. From the distilled oil of this by refrigeration the crystalline menthol is obtained in unusually large proportion for medicinal purposes [E. Holmes]. The plant is said to have been used in Japan at least 2,000 years [Christy]. Mints of various kinds could probably be reared with advantage also as anti-malarian.

Mentha laxiflora, Bentham.

Victoria and the most Southern parts of New South Wales This, the Australian "Forest-Mint," furnishes a peculiarly pleasant oil, not dissimilar to that of peppermint. A fair oil can also be distilled from M. Australis (R. Brown), the common "River-Mint" of South-Eastern Australia.

Mentha piperita, Linné.*

The "Peppermint." Middle-Europe. This well-known perennial herb is important for its peculiar essential oil. This distilled oil is in considerable demand, and would be best obtained from plants cultivated in mountain-regions or naturalised along forest-rivulets. The annual production of oil of peppermint is estimated at 90,000 lbs., two-thirds of which are prepared in the State of New York [Masters]. Eminent authorities refer the Peppermint as a variety to Mentha aquatica, L., the Water-Mint of Europe, North America, West- and North-Asia; from which the true Crisp Mint (M. crispa, Linné) is again derived, as well as the Bergamot-Mint (M. citrata, Ehrhart). Mr. Slater's experience for years at Port Phillip has been, that from a ton of the cut herb 5 to 7 lbs. of oil can be distilled, worth about 35s. a lb.; he obtained about 3 tons of cut herb from an acre. The writing "Minth" or "Menth" is preferable, the former in accordance with Hippocrates and Theophrastos, the latter according to Plinius' writing for M. piperita.

Mentha Pulegium, Linné.

The true "Penny-royal." Europe, Western Asia, Northern Africa. A perennial scent-herb, yielding a peculiar ethereal oil. It likes moist soil. To be avoided for naturalisation on pastures, as not readily repressed.

Mentha rotundifolia, Hudson.

Western and Southern Europe, Northern Africa, Western Asia. Fond of wet places, which by the culture of this and other mints may be profitably utilised. In odor this mint approaches to Melissa. The French and Italian Crisp Mint is partly derived from this species. Closely allied to the following, and often regarded as a variety of M. viridis. The Crisp Mint of Greece is M. tomentosa (D'Urville).

Mentha longifolia, Hudson (*M. silvestris,* Linné.)

The "Horse-Mint." Europe, Northern Africa, temperate Asia. Perennial. One of the Crisp Mints is derived from this species. Hardy, like the three preceding species, to lat. 59° 55′ in Norway [Schuebeler].

Mentha viridis, Linné.

The "Spearmint." Middle and Southern Europe. Perennial. A particular sort of Crisp Mint (M. crispata, Schrader) belongs to this species. Readily propagated like other mints by division of the root.

Menyanthes trifoliata, Linné.

Inappropriately called the Bog-bean or Buck-bean. Europe, Northern and Middle Asia, North-America. In springy and spongy bogs. A perennial herb of great beauty, which could be naturalised with facility in any cold regions. Indigenous as far north as lat. 71° 10′ in Norway [Prof. Schuebeler]. The root is starchy. The whole plant is pervaded by a bitter principle, largely derived from menyanthin. The plant is used medicinally as a tonic and febrifuge.

Meriandra Abyssinica, F. v. Mueller. (*M. Benghalensis,* Bentham.)

Abyssinia, on high mountains. A shrub of penetrating odor; utilised much like sage.

Mesembrianthemum æquilaterale, Haworth.

Australia and West-coast of America. This widely creeping species spreads readily over saline ground, whether clayey, sandy or rocky. Mr. J. Clode observes, that sheep are very fond of this succulent plant, and require but little water when browsing on it; or in cool coast-districts they will do without any water even in summer, while thriving well on the foliage. Fruit with a sweetish edible

pulp. This species with M. Australe (Haworth) forms on the Australian coasts one of the most effectual first impediments to the influx of sea-sand; both should be encouraged in their growth at the very edge of the tide. Not less hardy than M. edule.

Mesembrianthemum capitatum, Haworth.

South-Africa This perennial species, from the readiness and quickness of its growth, and from the abundance of its seeds and their easy dispersion, is one of the best for staying any rolling sea-sand [Dickinson]. M. pugioniforme (Linné) and many other species serve the same purpose.

Mesembrianthemum Barklyi, N. Brown.

Namaqua-land. About 2 feet high, but also widely creeping. Leaves large, replete with aqueous sap, so much so, as to allay, when consumed by pasture-animals, their thirst [Sir Henry Barkly].

Mesembrianthemum crystallinum, Linné.

The Ice-Plant. Countries at the Mediterranean Sea and South-Africa. Annual. Recently recommended as a spinach-plant. Can be grown on bare sand, which it helps to cover. Eaten by sheep. In Norway it will succeed northward to lat. 69° 18'.

Mesembrianthemum edule, Linné.

The "Hottentot-fig" of South-Africa. Under the same vernacular name is also comprised the distinct M. acinaciforme, which however, as regards fruit is far inferior. Should be transferred to any of the most inhospitable desert-regions, as it affords in the inner part of its fruit a really palatable and copious food. It proved hardy in Southern England.

Mesembrianthemum floribundun, Haworth.

South-Africa. This succulent perennial with many allied species from the same part of the globe is a far more important plant than might be assumed, because "a good stretch of this is worth as much as a dam" [Professor McOwan]. Succulent plants like these would live in sandy deserts, where storage of water may be impracticable.

Metrosideros tomentosa, Cunningham.

Northern Island of New Zealand. Could be grown for timber on rocky sea-shores. Height reaching about 80 feet; trunk stout, but comparatively short. The timber, according to Professor Kirk deserves attention, as one of the most durable for the frame-work in ship-building, for jetties, docks, sills. Other species with dense wood, occurring in New Zealand, are M. lucida (Menzies) and M. robusta (Cunn.), both ornamental trees with crimson flowers, called Ratas by the Maories.

Metrosideros polymorpha, Gaudichaud.

Hawaian Islands to 6,000 feet altitude, Society- and Fiji-Islands, Howe's Island. In Hawaia the most widely distributed tree. A large tree, furnishing a hard, tough and very durable timber [Dr. Hillebrand].

Michelia excelsa, Blume.

In the Himalayas and other Indian mountains, up to 8,000 feet. It grows to a large size, supplying boards to 3 feet in width, and is one of the best timber-trees there. Foliage deciduous; flowers large, white; wood yellowish. M. lanuginosa (Wallich) ascends there also to temperate regions with M. Kisopa (Hamilton), M. Cathcartii (Hooker and Thomson), M. Champaca (Linné), M. Punduana (H. & Th.) and M. Nilagirica (Zenker), all being tall trees.

Micromeria Douglasii, Bentham.

The "Yerba Buena." Western North-America. A perennial herb of medicinal, particularly anthelminthic, properties.

Microseris Forsteri, J. Hooker.

The Native Scorzonera of extra-tropical Australia and New Zealand. A perennial herb, deserving attention, as its root would probably enlarge and improve through culture. On alpine mountains the plant developes most luxuriantly during summer. The Australian aborigines use the root for food. The plant would prove hardy in Middle Europe.

Milium effusum, Linné.

English Millet-Grass. Europe, North- and Middle-Asia, North-America. Perennial, suited for damp forest-land particularly, the pastural capabilities of which it enhances. On river-banks it attains a height of 6 feet. It is relished by cattle. The seeds can be used like millet, the stems for the manufacture of superior straw-hats. It is a great favorite with pheasants and many other birds for the sake of its seeds, which ripen early in the season. Indigenous in Norway as far north as lat. 71° 7′ [Schuebeler]. Nutritious hay to the extent of 3 tons on an acre obtainable from this grass [Coleman].

Mimosa rubicaulis, Lamarck.

All India, extending to Afghanistan, ascending to 5,000 feet. A hedge-bush, almost inapproachable, growing finally to tree-height. It has proved hardy at Melbourne, enduring some frost.

Mimusops globosa, Gaertner.

Central America. Tree, reaching a height of about 120 feet, perhaps fit like many other Sapotaceæ for frostless extra-tropic

regions. The milky juice from cuts into the stem when exsiccated forms the Balata of commerce, a substance in its qualities allied both to Gutta-percha and India-rubber [Jenman]. Wood very dense and also elastic.

Mimusops Sieberi, A. de Candolle.

West-Indies and Florida. Tree reaching 30 feet in height. Fruit of agreeable taste [Sargent].

Monarda didyma, Linné.

Eastern North-America. Hardy to lat. 59° 55′ in Norway. A perennial odorous herb, producing the medicinal Oswego- or Beebalm-Tea. M. fistulosa, L., and several others are also of very strong scent. Their volatile oil contains thymol.

Monarda punctata Linné.

Eastern North-America, where it is called "Native Horse-mint." Bees extract an astonishing quantity of honey from this plant. M. citriodora (Cervantes) is an allied lemon-scented species, extending from the South-Western States to Mexico.

Monodora Angolensis, Welwitsch.

Tropical West-Africa, up to the comparatively cool elevation of 3,500 feet. A tree attaining 30 feet in height. The pleasantly aromatic seeds come into the market, like those of the following species; they measure about half-an-inch in diameter and are produced in good numbers.

Monodora Myristica, Dunal.

The Calabash-Nutmeg. West-Africa, within the tropics, ascending to 2,500 feet. A tree attaining as a maximum 60 feet in height [Dr. Welwitsch]. Leaves occasionally 2 feet long and 8 inches broad; foliage thus grand. Hardy at Port Jackson, according to Mr. Ch. Moore. The seeds serve as nutmegs.

Montia fontana, Linné

In many of the cooler regions of the world. A very small annual herb. Consumed in Thuringia and in the adjoining countries much as salad [Prof. Noerdlinger]. Easily naturalised on springy ground.

Monstera deliciosa, Liebmann.

Mexico and Guatemala, in the mountainous region. One of the grandest of aroid plants, climbing to a height of 12 feet or occasionally more; leaf-stalks often 3 feet long. The fruit is edible, and of a luscious ananas-flavor [Dr. Masters]. In Australia it ripens as far south as Port Jackson. The plant is important also for scenic culture. Succeeds as far south as Durban in Natal [J. M. Wood].

Morchella conica, Persoon.

Europe, Asia, Northern and Central America, northward to lat. 70° in Norway. With M. semilibera this Morel has been found in Victoria and New South Wales; its spread should be encouraged by artificial means, as it is a wholesome esculent. Kohlrausch and Siegel found 29 to 35 per cent. of protein in Morels when dried. European superior species, probably admitting of introduction, are: M. esculenta, M. Gigas, Pers., M. rimosipes, D.C., M. Bohemica, Krombh., M. deliciosa, Fries (which extends to Java), M. patula, Pers. and M. Smithiana, the Bell-Morel; but several others occur in other parts of the globe. Though these fungs show a predilection for pine-forests, they are not dependent upon them; thus the writer found M. conica (Persoon) in Eucalyptus-forests, and this late in the autumn. M. esculenta is an early spring-species. M. Smithiana is over a foot high. They can all be dried and preserved for culinary purposes. Morels contain some poison-principle, called Helvella-acid, which needs removal by boiling them in water; this acid is volatile or readily decomposed, so that dried Morels are nearly free of it [Boehm and Kuelz].

Moringa pterygosperma, Gaertner.

The Horseradish-Tree of India, abundant as far as the middle regions of the mountains. Height to about 20 feet, but thick-stemmed. Fruits in Eastern subtropic Australia copiously. The plant is reared readily. The long pods are of culinary use; the seeds are somewhat almond-like and rich in oil, which has no perceptible smell, and is esteemed by watchmakers particularly. Gum exudes from the stem. M. aptera (Gaertner) occurs from Abyssinia and from Egypt to Arabia and Syria. M. Concanensis (Nimmo) is an allied species from the drier regions of North-Western India.

Morus alba, Linné.*

The White Mulberry-tree. Upper India and Western China. This tree in several varieties provides the food for the ordinary Chinese silk-insect (Bombyx Mori). Silk was produced in Italy 700 years ago, and this branch of industry has flourished there ever since. In China silk has been reeled for 4,500 years; this may demonstrate the permanency of an industry, which we wish to establish extensively anywhere under a similar sky. "One pound of silk is worth its weight in silver, and this pound may be produced (so far as the food of the Bombyx is concerned) from thirty pounds of mulberry-leaves or from a single tree, which may thus be brought to yield annually the material for 16 yards of Gros de Naples" [R. Thompson]. The White Mulberry-tree is of extremely easy growth from cuttings, also readily raised from well-matured seeds. It is usually unisexual, and finally attains a very large size, It can still be grown in climes, where olives will no longer thrive. In Norway the tree bore seeds in lat. 59° 55′ [Schuebeler]. It passed through years of severe drought in Central Australia [Rev.

H. Kempe]. Spots for Mulberry-culture must not be over moist, when the leaves are to be utilised for the Bombyx. In 1870, according to the *British Trade-Journal*, the produce of cocoons amounted in Europe to £16,588,000; in Asia to £28,112,000; in Africa to £44,000; in the South-sea Islands to £24,000; in America to £20,000—thus giving a general total of £44,788,000. In 1875 the yield of raw silk in the district of Rajshahye (British India) was estimated at £400,000, employing about 12,000 people, the plantations extending approximately over 150 square miles [Dr. S. Forbes Watson]. In that district alone a quarter of a million people derive their support from the trade and other branches of the silk-industries. Great Britain imported in 1884 4,519,000 lbs. of raw silk, to a value of 3,341,000; of thrown silk, husks and waste to the value of £907,000, irrespective of manufactured silk-goods, the cost of which amounted to nearly eleven million pounds sterling. In 1889 the imports came to 3,123,000 lbs. of raw silk of a declared value of £2,192,000, 607,000 lbs. of thrown silk worth £511,000, husks and waste to the amount of about £900,000, and manufactured to the value of £11,790,000. The French Goverument fostered in 1890 the silk-production within its own territory by a subsidy of £140,000. Superior varieties of mulberry can be grafted with ease on ordinary stock. M. Indica, L., M. macrophylla, Moretti, M. Morettiana, Jacq., M. Chinensis, Bertol., M. latifolia, Poir,. M. Italica, Poir., M. Japonica, Nois., M. Byzantina, Sieb., M. nervosa, Del., M. pumila, Nois, M. tortuosa, Audib., as well as M. Constantinopolitana, Lamarck. which according to Professor C. Koch is identical with M. multicaulis of Perrottet, are merely forms of M. alba, to which probably also M. Tatarica, L. and M. pabularia, Jacquin, belong. The variety, known as M. Indica, produces black fruits. The raising of Mulberry-trees has recently assumed enormous dimensions in California, where between seven and eight millions were planted since 1870. The process of rearing the silk-insect is simple, and involves no laborious exertions. The cocoons, after they have been properly steamed, dried and pressed, readily find purchasers in Europe, the price ranging according to quality from 3s. to 6s. per lb. The eggs of the silk-moth sell at a price from 16s. to £2 per ounce; in 1870, Japan had to provide two millions of ounces of silk-ova for Europe, where the worms had extensively fallen victims to disease. As an example of the profit to be realised, a Californian fact may be cited, according to which £700 were the clear gain from the $3\frac{1}{2}$ acres, the working expenses having been £93. The Commissioner of Agriculture of the United States has estimated, that under ordinary circumstances an acre should support from 700 to 1,000 mulberry-trees, producing, when four years old, 5,000 lbs. of leaves fit for food. On this quantity of leaves can be reared 140,000 worms, from which ova at a net-profit, ranging from £80 to £240 per acre, will be obtained by the work of one person. Mr. C. Brady, of Sydney, thinks the probable proceeds of silk-culture to be from £60 to £150 for the acre. The

discrepancies in calculations of this kind are explained by differences in clime, soil, attention, treatment and also rate of labour.

A very palatable fruit is obtained from a variety cultivated in Beloochistan and Afghanistan. The white-fruited tree was found apparently wild by Dr. A. v. Regel, at Taschkend and Tutkaul; the stems there were 7 feet thick.

The results of Mr. Brady's experience on the varieties of Morus alba are as follows: In the normal form the fruits are white with a purplish tinge more or less deep; the bark is pale; the leaf is also of a pale hue, not very early, nor very tender, nor very abundant. It may be grown on moist ground, so long as such is drained, or it will live even on poor, loose, gravelly soil, bordering on running water. The Cevennes-variety is a free grower, affords a large quantity of leaves, though of rather thick consistence; all varieties of the Morus-Bombyx like these leaves, whether young or old; it is also called the Rose-leaved variety; the silk, which it yields, is substantial in quantity and also good in quality; does best on rich dry slopes. The bushy Indian variety has a fine leaf of a beautiful green, which, though light in weight, is abundantly produced; it can be cut back to the stem three or four times a year; the leaves are flat, long and pointed, possess a fine aroma, and are relished by every variety of the ordinary silk-insect, though all do not thrive equally well on it; the silk derived from this variety is excellent, but not always so heavy in quantity as that produced from the rosy variety; it prefers rich, low-lying bottoms, is a greedy feeder, but may thus be made to cover an extraordinary breadth of alluvial or manured land in a marvellously short space of time. At Sydney Mr. Brady can provide leaves from this Indian variety all through the year by the removal of cuttings, which will strike their roots almost at any season; it also ripens seeds readily, and should be kept at bush-size; it requires naturally less space than the other kinds. A fourth variety comes from North-China; it has heart-shaped, flat, thickish leaves, which form very good food for the silkworm. Mr. Brady, as well as Mr. Martelli, recommend very particularly the variety passing under the name of Morus multicaulis for the worms in their earliest stages. The former recommends the Cape-variety also; the latter wishes likewise the variety called Morus Morettiana to be used on account of its succulent nutritious foliage, so well adapted for the insect, while yet very young, and also on account of producing the largest amount of food within the shortest time. This Manilla-variety, above mentioned as Morus multicaulis, comes into bearing several weeks earlier than most other sorts, and should therefore be at hand for early hatched worms. An excellent phytological exposition of the numerous varieties of the White Mulberry-tree is given in De Candolle's prodromus XVII. 238-245 (1873), by Bureau.

The Muscardine-disease is produced by Botrytis Bassiana, while the still more terrible Pebrine-disease is caused by a minute psorospermous organism. On the Pebrine Pasteur's researches

since 1865 have shed much light. Countries like ours, happily free from these pests, can thus rear healthy silk-ova at a high premium for exportation.

The White Mulberry-tree, with others, offering food to the silk-worms, such as the osage-orange, should be planted copiously everywhere for hedges or copses. A very soft textile fibre is obtained from the bark of the Chinese Mulberry-tree. A variety of the White Mulberry-tree (M. lævigata, Wallich) furnishes in Assam, where it is called the "Bola," almost exclusively the wood for paddles and oars [W. R. Fisher].

Morus celtidifolia, Humboldt.

From Peru to Mexico, ascending to 8,000 feet. The fruit of this Mulberry-tree is edible. Rev. Prof. Sodiro, of Quito, praises particularly the wood of this tree for building purposes. M. insignis (Planchon), from New Granada, is a similar species; it reaches elevations of 11,000 feet, is therefore a plant fit also for the cold temperate zone, and deserves thus general cultural attention.

Morus nigra, Linné.*

The Black Mulberry-tree. South-Western Russia and Persia. Attains a height of about 60 feet. Highly valuable for its pleasant refreshing fruits. It is a tree of longevity, instances being on record of its having lived through several centuries; it is also very hardy, enduring the winter-cold of Norway to latitude 61° 15′; at Christiania it bore fruit [Schuebeler]. Mr. John Hodgkins regards it as a superior tree for sandy coast-ridges. The leaves of this species also afford food for the ordinary silk-moth, and are almost exclusively used for this purpose in the Canary-Islands, although the produce therefrom is not always so good as that from M. alba. The tree occurs usually as unisexual. M. atropurpurea (Roxburgh), from Cochin-China, is an allied tree. The cylindrical fruit-spike attains a length of 2 inches. A palatable, somewhat vinous beverage can be obtained by fermentation from Mulberries.

Morus rubra, Linné.*

The Red Mulberry-tree. Eastern North-America, North-Mexico. The largest of the genus, attaining a height of about 70 feet; it produces a strong and compact timber, of wonderful endurance underground; hence in demand for posts and railway-ties [General Harrison], also for knees of small vessels [Dr. C. Mohr], and a variety of other purposes. Fruit edible, sweet, large. The tree is still hardy in Christiania [Schuebeler]. It requires a deep rich soil and endures shade [Fernow]. Rate of circumferential stem-growth in Nebraska 43 inches in 18 years [Furnas].

Mucuna Cochinchinensis, Bentham. (*Macranthus Cochinchinensis,* Loureiro.)

A climbing annual, which can be reared in the open air in England. Pods, cooked as a vegetable, taste like those of kidney-beans [Johnson].

Muehlenbergia diffusa, Willdenow.

Southern States of North-America. Perennial. Recorded among the good native fodder-grasses of Alabama by C. Mohr, thriving as well on dry hills as in low damp forest-ground. Prof. Killebrew mentions, that this grass in Tennessee carpets the soil in forests with a living green. M. glomerata (Trinius) is in the same region a pasture- and hay-grass, available on wet meadows [Dr. Vasey].

Muehlenbergia Mexicana, Trinius.

Southern parts of North-America. A perennial good fodder grass, particularly fit for low humid ground, also for forests. Root creeping; stem much branched, bending down.

Murraya exotica, Koenig.

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South-Asia, Polynesia, East- and North-Australia. This shrub or small tree is one of the best among the odoriferous plants in India [C. B. Clarke]. M. Koenigii (Sprengel) ascends the Himalayas to 5,000; its leaves are in frequent use as an ingredient of curries.

Musa Cavendishii, Lambert.* (*Musa regia,* Rumph; *Musa Chinensis,* Sweet; *Musa nana,* Loureiro.)

The Chinese Banana. A comparatively dwarf species, the stem attaining a height of only about 5 or 6 feet. Its robust and dwarf habit render it particularly fit for exposed localities, and this is one of the reasons, why it is so extensively cultivated in the South-Sea Islands. It is also less liable to disease than the other cultivated species, and keeps better in transit. The yield of fruit is profuse (even as much as 200 to 300 fruits in a spike), and the flavor excellent. Mr. J. S. Edgar states, that bunches of this banana with thirty dozen fruits are no rarity at Keppel-Bay. General Sir John Lefroy saw bunches of 80 lbs. weight produced in Bermuda, where the plant bears fruits all the year round. This, as well as M. sapientum and M. paridisiaca, still ripens its fruits in Madeira, Florida and at Port Jackson, where it can be reared more profitably than M. paradisiaca. Introduced about 50 years ago by the Duke of Devonshire through the Rev. J. S. Williams to the South-Sea Islands, and by the Earl of Derby, through Mr. Mills, to Australia. The specific name, given by M. Loureiro, is entitled to preference. All Musas are grand honey-plants.

Musa cornicolata, Rumph.*

Insular India. Fruits as large as a good-sized cucumber; skin thick; pulp reddish-white, firm, dry, sweet; an excellent fruit for cooking [Kurz]. The Lubang-variety is of enormous size.

Musa Ensete, Gmelin.

Bruce's Banana. From Sofala to Abyssinia in mountain-regions. This magnificent plant attains a height of about 30 feet, the leaves occasionally reaching the length of fully 20 feet, with a width of 3 feet, being perhaps the largest in the whole empire of plants, exceeding those of Strelitzia and Ravenala, and surpassing even in quadrate-measurement those of the grand water-plant Victoria Regia, while also excelling in comparative circumference the largest compound frond of Angiopteris evecta, or the divided leaf of Godwinia Gigas, though the leaves of some palms are still larger in circumference. The inner part of the stem and the young spike of the Ensete can be boiled, to serve as a table-esculent, but the fruit is pulpless. This plant produces no suckers, and requires several years to come into flower and seed, when it dies off like the Sago-Palm, the Caryota-Palm and others, which flower but once, without reproduction from the root. It is probably the hardiest of all species, enduring slight frosts.

Musa Livingstoniana, Kirk.

Mountains of Sofala, Mozambique and the Niger-regions. Similar to M. Ensete; seeds much smaller. This superb plant requires no protection in favorable places in warm temperate climes, as it advances in its native country to elevations of 7,000 feet. This and a Musa of Angola, like M. Ensete, form no suckers.

Musa paradisiaca, Linné.*

The ordinary Plantain or Pisang. Continental and Insular India. Among the most prolific of plants, requiring the least care in climes adapted for its growth. Stem not spotted. Bracts purple inside. In this as well as M. Cavendishii and M. simiarum, new shoots are produced from the root, to replace annually the fruit-bearing stem. The fruit of this is often prepared by some cooking process. Very many varieties are distinguished, and they seem to have sprung from the wild state of M. sapientum. The writer did not wish to pass this and the allied plants unnoticed, as they will endure the clime in warmer localities of the temperate zone, where under careful attention they are likely to mature their fruit with regularity. They require rich and humid soil. All kinds demand when in continued culture, heavy manuring, to come to the best development. Plantain-meal is prepared by simply reducing the dried pulp to powder; it is palatable, digestible and nourishing. M. sapientum, L., the ordinary Banana or Sweet Plantain is a variety. In Java the Pisang-variety is grown up to 4,000 feet

elevation [Dr. Treub]. It is one of the most important plants among those yielding nutritious delicious fruits. The stem is spotted; bracts green inside. The leaves and particularly the stalks and the stems of this and other species of Musa can be utilised for producing a fibre similar to Manilla-hemp, though not so strong. The fruit of this species is used chiefly unprepared; it is generally of a yellow color. Numerous varieties are distinguished. Under favorable circumstances as much as a hundredweight of fruit is obtained from a plant annually in tropical climes. At Caraccas, where the temperature is seldom much above or below 70° F., the plantain- and banana-plants are very productive, being loaded with fruits 12 to 15 inches long, on mountains up to 5,000 feet. In the dry Murray-regions of South-Eastern Australia the winter-temperature seems too low for the successful development of the plants except on sheltered spots; but bananas will ripen under the shelter of limestone-cliffs as far south as Swan-River in West-Australia. The plant matures its fruit also yet in the Canary-Islands. The fibre of any kind of Musa can be turned to some account, though the value is various. The banana requires infinitely less care within its geographic latitudes than the potato; contains along with much starch amply protein-compounds. The preparation of starch from bananas is lucrative, as the yield is copious. Many Indian populations live very extensively or almost exclusively on this fruit. In hot countries the tall Musas are sometimes reared as nurse-plants. Jamaica alone exported during 1885 bananas to the value of £130,000, this culture still increasing there [Dr. Masters]. The import merely from Fiji into Port Jackson has been 30-40,000 bunches in a fortnight [M. Macgillivray]. The American "fruit-drier" can advantageously be employed also for the exsiccating of Bananas. Mr. W. Reynolds, of Daintree-River, Northern Queensland, has of late years successfully started banana-drying for export to the European markets. It is the small-fruited variety, which is especially eligible for this purpose; thus prepared it rivals dried figs, raisins and dates on the dessert-table.

Musa simiarum, Rumph.* (*M. corniculata*, Loureiro; *M. acuminata*, Colla).

From Malacca to the Sunda-Islands. About half-a-hundred marked varieties of this species, called mainly Pisangs in India, are under cultivation there, especially on the Archipelagus, while M. sapientum occurs wild more frequently on the mainland. Though the latter is principally cultivated on the Indian continent, yet it never equals in delicacy the cultivated forms of M. simiarum, the fruit of which sometimes attains a length of 2 feet [Kurz].

Musa textilis, Nee.*

Philippine-Islands. This species furnishes the widely utilised Manilla-rope fibre; the plant was introduced first into Australia by the author, and may thrive in subtropic regions. It likes

volcanic forest-land. Much of the fibre is exported to America for paper. About 1 lb. of fibre is annually obtained from each plant [Simmonds].

Musa troglodytarum, Linné. (*M. uranoscopos,* Rumph.)

India, perhaps indigenous also in the Fiji- and other islands of the Pacific Ocean. The fruit-stalk of this species stands upright; the edible fruits are small, reddish or orange-colored; pulp gamboge-yellow, mawkish-sweet [Kurz]. The Chinese M. coccinea (Aiton), a dwarf ornamental species, has also the fruit-spike straight.

Mutisia viciifolia, Cavanilles.

From Chili to Bolivia. This shrubby climber has through Dr. Sacc come recently into medicinal use for treatment of phthisis [Prof. Naudin].

Myoporum laetum, Forster.

New Zealand, where it is called Ngaio by the aborigines, also in the Chatham-Islands. As a shelter-tree it is equal to the Australian M. insulare for the most exposed parts of the coast. It is excellent for shade, and its wood takes a fine polish. It can be raised on the beach from cuttings. Uprooted it will produce new roots, if covered in near the sea. Sheep, cattle and horses browse on the foliage.

Myrica Californica, Chamisso and Schlechtendal.

Californian Sweetgale-Tree, attaining 40 feet in height and a stem-diameter of 3 feet. The leaves, pervaded by a balsamic resinous-oily principle, are of medicinal value [Dr. Kellogg]. The root-bark of several Myricas is also turned to therapeutic account.

Myrica cerifera, Linné.

The Wax-Myrtle or "Bay-Berry." Sandy sea-coast of Eastern North-America. This shrub helps to bind the rolling sand; it has fragrant leaves; the fruits are boiled, and the floating wax, which can be converted into candles, is skimmed off. In Patagonia, Argentina and Chili the scrophularinous Monttea aphylla, Bentham (Oxycladus aphyllus, Miers), yields vegetable wax from its branches [Lorentz].

Myrica cordifolia, Linné.

South-Africa. This bushy plant arrests the influx of the sea-sand; it also yields wax from its fruits in remunerative quantity.

Myrica Faya, Aiton.

Madeira, Azores and Canary-Islands. A small tree. The drupaceous fruits are used for preserves.

Myrica nagi, Thunberg. *(M. Sapida,* Wallich.)

Continental India, up to 7,000 feet, China, Japan, Borneo. A shady evergreen tree. The fruit is one of the best of North-Western India, is of vinous sweetish taste, and is there eaten by all classes [Edwin Atkinson]. The bark serves for a brown-dye.

Myrica quercifolia, Linné.

South-Africa. This is one of the principal wax-bushes there. Many other species from different parts of the globe are available for trial-culture, but none have as yet been discovered in Australia.

Myrica serrata, Lamarck.

South-Africa. Shrub, only about 3 feet high. Also wax-yielding. The Myrica-wax is heavier, harder and more brittle than bees' wax, but melts more easily; it is got from the fruits throughout the cool season. The sowing of seeds is done after the first rain of the cool months has steadied the loose sand; the plant can also be multiplied from cuttings. The subterraneous trunk is creeping, and in age of considerable length [Dr. Pappe].

Myrrhis odorata, Scopoli.

The Sweet Chervil or Cicely. Mountains of Middle and Southern Europe and Asia Minor, particularly in forests. A perennial aromatic herb, used for salad and culinary condiments. It could be naturalised in forests, and would endure an alpine climate; a second species, M. occidentalis (Bentham), occurs in Oregon and Utah. Asa Gray keeps this with two additional Californian congeners in the genus Glycosma.

Myrtus acmenoides, F. v. Mueller.

Queensland. The fragrant leaves of this and of M. fragrantissima used locally for flavoring tea, according to Mr. P. O'Shanesy.

Myrtus Cisplatensis, Bentham and J. Hooker.

La Plata-States. A middle-sized tree. Berries edible [Prof. Hieronymous].

Myrtus communis, Linné.

Countries around the Mediterranean Sea. The Bridal Myrtle. Blooms in Arran [Rev. D. Landsborough]. Available as a Calendar plant. This bush of ancient renown should not be passed; it is industriously in requisition for myrtle-wreaths. Hippocrates already used the leaves in medicines.

Myrtus edulis, Bentham. (*Myrcianthes edulis,* Berg.)

Uruguay. A tree, attaining a height of about 25 feet. Berries of $1\frac{1}{2}$ inch diameter, of pleasant taste.

Myrtus incana, Berg.

La Plata-States. A dwarf shrub. The berries can be eaten raw, and are also made into a sweet rich jelly. M. sericea (Cambessedes) is an allied species from the same region.

Myrtus Luma, Molina.

South-Chili. A tree, to fully 100 feet high in the virgin-forests. Wood very hard and heavy, much sought for press-screws, wheel-spokes and select implements [Dr. Philippi].

Myrtus Meli, Philippi.

South-Chili. Of the same use as the foregoing species, and in this manner most favorably contrasting with the numerous other myrtaceous trees of Chili.

Myrtus mucronata, Cambessedes.

La Plata-States. A low shrub. The leaves serve locally as a substitute for tea. The berries, which are of the size of muscatel-grapes, are of pleasant taste, and therefore consumed by the native inhabitants [Hieronymus].

Myrtus nummularia, Poiret.

The Cranberry-Myrtle. From Chili to Fuegia, also in the Falkland-Islands. This trailing little plant might be transferred to the turfy moors of any alpine mountains. Sir J. Hooker describes the berries as fleshy, sweet and of agreeable flavor. Allied species occur in the cold zone of the Peruvian Andes.

Myrtus tomentosa, Aiton. (*Rhodomyrtus tomentosa,* Wight.)

India and China. This showy shrub ascends to 8,000 feet, The berries are dark-purple, of cherry size, pulpy and of aromatic sweetness. Various other Myrtles with edible berries are known from different warm countries.

Myrtus Ugni, Molina.*

The Chilian Guava. A hardy shrub, freely bearing its small but pleasantly aromatic berries.

Nageia (Podocarpus) amara, Blume.

Java, on high volcanic mountains. A large tree, sometimes to 200 feet high. Timber valuable. The genus founded on Gaertner's description of the fruit of his Nageia Japonica.

Nageia (Podocarpus) andina, Poeppig. (*Prumnopithys elegans,* Philippi).

The "Lleuque" of Chili, extending to Ecuador. A stately tree, with clusters of edible cherry-like fruits. As might be expected from its native place, it will bear severe frost—0° F. [Gorlie]. The wood is yellowish and fine-grained, and is chosen for elegant furniture-work. Specially praised by Prof. Sodiro, of Quito.

Nageia (Podocarpus) bracteata, Blume.

Burmah, Borneo, Java, up to 3,000 feet. Generally reaching about 80 feet in height, with a straight trunk and horizontal branches. The close-grained wood is highly prized. The allied N. neriifolia from the Himalayas has proved hardy at Melbourne.

Nageia (Podocarpus) Chilina, Richard,

The "Manniu and Lahaul" of Chili and Peru, ascending to sub-alpine elevations. Height reaching 100 feet, with corresponding thickness of stem. Wood white, of excellent quality.

Nageia (Podocarpus) coriacea, Richard.

West-Indies. This tree attains a height of 50 feet, and advances to elevations of 8,000 feet. Other species of both hemispheres should be tested, beyond those here now mentioned.

Nageia (Podocarpus) cupressina, R. Brown.

Java and Philippine-Islands. Height of tree to 180 feet; furnishes a highly valuable timber.

Nageia (Podocarpus) dacrydioides, A. Richard.

In swampy ground of New Zealand; the "Kahikatea" of the Maories, called White Pine by the colonists. Height to about 150 feet; diameter of stem often 4 feet. The white sweet fruit (fruit-stalklet) is eaten by the natives; the wood is pale, close-grained, heavy; it will not stand exposure to wet, but is one of the best for flooring-boards. The strength is equal to that of "Rimu;" but it is more readily attacked by boring insects. Refer for further information on this and other N.Z. timber-trees to Kirk's Illustrated Forest-Flora of New Zealand, issued 1889.

Nageia (Podocarpus) elata, R. Brown.

East-Australia to 35° S. A fine timber-tree, attaining a height of about 80 feet, with a stem 2 feet in diameter. The timber is soft, close-grained, free from knots, much used for joiner's work, also for spars. Market price in Brisbane £3 5s. to £3 10s. per 1,000 superficial feet [Queensland Exhibition, 1867].

Nageia (Podocarpus) elongata, L'Héritier.

South-Africa. With N. Thunbergi, Erythrina Caffra (Thunberg) and Ocotea bullata (Bentham), one of the tallest trees of Capeland and Caffraria, although it does not advance beyond 70 feet. The yellowish wood is highly valuable, deal-like, but closer and tougher, and not resinous. The stems can be used for top-masts and yards of ships.

Nageia (Podocarpus) ferruginea, D. Don.

Northern parts of New Zealand. The "Black Pine" of the colonists; native name "Miro." Height reaching about 80 feet; it produces a dark-red resin of a bitter taste. The wood is of a reddish color, very hard; the strongest among those of New Zealand conifers; will stand exposure to sea-water; not durable when in contact with the ground [Kirk, Forest-Flora of New Zealand]. Fruit solitary.

Nageia (Podocarpus) Lamberti, Klotzsch.

Ecuador to Brazil up to 10,000 feet. A stately tree, yielding valuable timber, specially praised by Prof. Sodiro, of Quito.

Nageia (Podocarpus) macrophylla, D. Don.

The "Inou-maki" of Japan. A tree attaining about 50 feet in height. The nut-stalklets used for food there. The wood is white and compact, employed for carpenters' and joiners' work; the bark for thatching [Dupont].

Nageia (Podocarpus) nubigena, Lindley.

Southern Chili, generally a companion of N. Chilina, with which it agrees in its dimensions and the utility of its timber.

Nageia (Podocarpus) Purdieana, Hooker.

Jamaica, at 2,500 to 3,500 feet. This quick-growing tree attains a height of 100 feet.

Nageia (Podocarpus) spicata, Brown.

Black Pine or "Matai" of New Zealand. Fruit spicate. Tree sometimes to 80 feet high; wood pale or reddish, soft, close and durable; used advantageously for piles, machinery, stringers, braces, mill-wrights' work, house-blocks, railway-sleepers, also weather-boards and flooring-boards. Mr. Buchanan gives an account of a Matai, which was found prostrate in the forest and over which three Griselinia-trees had grown, enfolding it in their roots; on felling these trees it was found that they were over 300 years old, but the Matai-wood was perfectly sound [Kirk, Forest-Flora of New Zealand].

Nageia (Podocarpus) Thunbergi, Hooker.

South-Africa. Superior to N. pruinosa (E. Meyer) and even N. elongata in the quality of its wood; it is bright-yellow, fine-grained, and very handsome when polished [Dr. Pappe]. Always a smaller tree than N. elongata according to Mr. Will. Tuck.

Nageia (Podocarpus) Totara, D. Don.*

New Zealand. A fine tree, to 120 feet high, with a stem reaching 20 feet in circumference; it is called Mahogany-pine by the colonists. The reddish, close-grained and durable wood is easily worked, valuable both for building and for furniture, and also extensively used for telegraph-posts; indeed it is considered one of the most valuable timbers of New Zealand, though it is somewhat brittle. Chosen for piles of bridges, wharves and jetties and in other naval architecture; the heart-wood resists decay and the attacks of the Teredo for a long time, according to Professor Kirk. It ranks below Kauri in strength, but equals it in durability. It is one of the most lasting woods for railway-sleepers, but the sap-wood should be taken off. When used for piles, the bark should not be removed from the timber. Many other tall timber-trees of the genus Podocarpus or Nageia occur in various parts of Asia, Africa and America, doubtless all desirable; but the quality of their timber is not well known, though likely in many cases excellent. Nageia is by far the oldest published name of the genus.

Nardostachys Jatamansi, De Candolle.

Mountains from Bengal to Nepal, at elevations from 11,000 to 17,000 feet [J. Hooker]. "The Spikenard." A perennial herb, famous in ancient times as a medicinal plant. The root contains an ethereal oil and bitter principle.

Nastus Borbonicus, Gmelin.

Réunion, where it forms a belt all round the mountains of the island, in a zone of 3–4,000 feet. This beautiful bamboo grows to a height of about 50 feet [General Munro]. A second species, namely N. capitatus (Kunth), occurs in Madagascar.

Nelumbo lutea, Caspary.* (*Nelumbium luteum*, Willdenow).

The Water-Chinquepin. In Eastern North-America, northward to 44°; also in Jamaica. This magnificent perennial water-plant carries with it the type of Nelumbo nucifera, but seems more hardy, and thus better adapted for extra-tropical latitudes, the Pythagorean Bean not descending in Australia naturally beyond 23°, although this species also may perhaps be able to live in the warmer parts of the temperate zone. The tuberous roots of both species resemble somewhat the Sweet Potato and are starchy; the seeds are of *particularly* pleasant taste. The plants would be of great value as

ornamental aquatics. The leaves of N. lutea are from 1 to 2 feet in diameter. The flower measures ½ to 1 foot across. The capsular fruit contains from 20 to 40 nut-like seeds. The plant in congenial spots displaces nearly all other water-vegetation by the vigor of its growth.

Nelumbo nucifera, Gaertner.* (*Nelumbium speciosum,* Willdenow).

The Pythagorean Bean or Sacred Lotus of the ancients. Egypt, on the Caspian and Aral Seas (46° N.); Persia; through India, where in Cashmere it occurs up to 5,000 feet elevation; China; Amur (46° N.); Japan, Philippine- and Sunda-Islands; New Guinea; tropical Australia as far south as 23°. One of the largest flowers in the world, with Victoria Regia, Nymphæa gigantea, some Magnolias, Paeonia, Liriodendron, Stapelea gigantea, some Aristolochias and Rafflesia Arnoldi. The occurrence of this grand plant at the Ima, at Pekin and at Astrachan proves sufficiently, that we can naturalise it in moderately cool climes, as has been done already by Marquis Ginoi at Doccia, near Florence. The plant luxuriates even in New Jersey, where when once established Mr. Sturtevant saw it retaining its vitality while dormant through successive winters underneath ice 6 inches thick. The Nelumbo requires deep water with a muddy bottom. The large white or rosy flowers are very fragrant. The seeds retain their vitality for several years. According to the ancient Egyptian method, they are placed in balls of muddy clay and chaff, and then sunk into the water. Not only the very palatable seeds serve for food, but also the stalks, which are used as a vegetable. According to Moorcroft this plant contributes much to the sustenance of some thousands of people in Cashmere for eight months in the year.

Nepeta Cataria, Linné.

Europe, Western Asia. The "Catmint." This somewhat aromatic herb is valued in domestic medicine. In France used as a condiment [Vilmorin]. Apiarists praise it also, Quinby stating, that if there was any plant, which he should cultivate especially, it would be this.

Nepeta Glechoma, Bentham. (*Glechoma hederacea,* Linné).

"The Ground-Ivy." Europe, Western Asia. This herb is still in great estimation as a pectoral medicine in many parts of Europe. It is also a honey-plant. Perennial like most cogeners.

Nepeta raphanorrhiza, Bentham.

Cashmere and Afghanistan. The roots of this herb furnish a delicious vegetable [Dr. Aitchison]; they have the taste of fresh almonds; large quantities are consumed by the inhabitants of the native countries of this plant.

Nephelium lappaceum, Linné.

South-India and Malay-Islands. This rather tall tree furnishes the Rambutan- or Rampostan-fruit, similar to the Litchi- and Longan-fruit. As one species of Nephelium is indigenous as far south as Gippsland (Victoria), and as all the species seem to require rather a moist mild forest-clime than great atmospheric heat, we may hope to bring this tree also to perfect bearing in favorable spots of a temperate clime.

Nephelium Litchi, Cambessedes.

Southern China, Cochin-China and the Philippine-Islands. An evergreen middle-sized tree, producing the Litchi-fruit. Fruits fairly well in subtropic Eastern Australia, also in favorable places as far south as Port Jackson. The pulpy arillus is of extremely pleasant taste, though not large.

Nephelium Longanum, Cambessedes.

India and Southern China. Height of tree to about 40 feet. The Longan-fruit is obtained from this tree; it is smaller than that of the Litchi-tree and less palatable. The tree prospers at Port Jackson [C. Moore].

Nephelium pinnatum, Cambessedes. (*Pometia pinnata,* Forster.)

Fiji and other Western South-Sea Islands. The "Darva." Hopes are held out that the fruits of this tree, similar to those of the Litchi, may become improved by cultivation [Horne].

Neurachne Mitchelliana, Nees.

The Mulga-grass. In the arid interior of Eastern and South-Eastern Australia. With its companion, N. Munroi (F. v. M.) eligible as a perennial fodder-grass for naturalisation in sandy or dry sterile land. It endures any extent of drought, but requires heavy rain to start anew [R. S. Moore].

Nicotiana glauca, Graham.

Argentina and Uruguay. This quickly growing arborescent species can be raised on mere sand on the coast, as one of the best of plants to establish shelter and stay the shifting of the sand-waves. There the poisonous quality of its foliage is not objectionable. It is inadmissible to pastural places on account of its deleteriousness.

Nicotiana multivalvis, Lindley.

The native Tobacco of the regions on the Columbia-River. An *annual.* This can be utilised for some inferior kinds of tobacco.

Nicotiana quadrivalvis, Pursh.

The native Tobacco of the Missouri. An annual.

Nicotiana repanda, Willdenow.

Cuba, Mexico, Texas. Annual. It is utilised for some of the Havanna-tobaccoes.

Nicotiana rustica, Linné.

Tropical America. Annual. Some exceptional sorts of East-Indian tobacco, of Manilla-tobacco and of Turkey-tobacco are derived from this particular species.

Nicotiana Tabacum, Linné.*

The ordinary Tobacco-plant of Central America. Annual. The tobacco-plant delights in rich forest-soil, particularly where lime-stone prevails. on account also of the potassium-compounds which abound in soils of woodlands, and also because in forest-clearings that atmospheric humidity prevails, which is needful for the best development of the finest kinds of tobacco. Various districts, with various soils, produce very different sorts of tobacco, particularly as far as flavor is concerned ; and again, various climatic conditions will greatly affect the tobacco-plant in this respect. We can therefore not hope to produce, for instance, Manilla- or Havanna-tobacco in cooler latitudes; but we may expect to produce good sorts also far south in Australia, more or less peculiar; or we may aspire to producing in our rich and frostless forest-valleys a tobacco similar to that of Kentucky, Maryland, Connecticut and Virginia. Frost is detrimental to the tobacco-plant; not only, particularly when young, must it be guarded against it, but frost will also injure the ripe crop. The scarcity of dew in some of the districts of Australia militates against the production of the best kinds, otherwise the yield as a rule is large, and the soil in many places well adapted for this culture. Leaves of large size are frequently obtained, but the final preparation of the leaf for the manufacturer must be effected by experienced skill. The cruder kinds are obtained with ease. Virgin soil, with rich loam, is the best for tobacco-culture, and such soil should also contain a fair proportion of lime and potash, or should be enriched with a calcareous manure and ashes, or with well decomposed stable-manure. According to Simmonds the average yield in Greece, where the clime is similar to ours, is about 800 pounds of tobacco per acre. In Norway Tobacco has been grown as far north as 70° 22′ [Schuebeler]. The equable mild clime of Northern New Zealand proved particularly well suited for producing superior tobacco. For Queensland experiences refer to S. Lamb's remarks in the Bulletin of the Department for Agriculture, Brisbane, No. 6 (1890). With us in Victoria the lowlands of Eastern Gippsland would be sure to

contain all the natural conditions for successful tobacco-culture. The seedlings, two months or less old, are transplanted. When the plants are coming into flower, the leading top-shoots are nipped off, and the lateral shoots must also be broken off. A few weeks afterwards the leaves will turn to a greenish yellow, which is a sign that the plants are fit to be cut, or that the ripe leaves can gradually be pulled. In the former case the stems are split; the drying is then effected in barns by suspension from sticks across beams. The drying process occupies four or five weeks, and may need to be assisted by artificial heat. Stripped of the stalks, the leaf-blades are tied into bundles, to undergo sweating or a kind of slight fermentation. It does not answer to continue tobacco-culture beyond two years on the same soil uninterruptedly. The Shiraz-tobacco is a variety cultivated in Persia [Sir Jos. Hooker; see also Dyer's Kew-Bulletin, April, 1891.] This can be brought to perfection only in cool mountain-regions. The mode of culture is somewhat different from that of the ordinary tobacco. Moderate irrigation is favorable. The plants, when ripe, are cut off and stuck into the ground again until they become yellow; they are then heaped together for a few days in the drying-house; they are afterwards stacked into thin strata, and placed into bags for pressure and daily turning. Another prominent variety is Nicotiana latissima (Miller), or N. macrophylla (Lehmann), yielding largely the Chinese, the Orinoco- and the Maryland-tobacco. Latakia-tobacco, according to Dyer, is prepared by submitting the leaves for several months to fumigation from fir-wood. Substances containing cumarin, particularly the Tonca-Bean (Dipterix odorata), are used to flavor tobacco and snuff. The dangerously powerful nicotin (a volatile acrid alkaline oily liquid) and nicotianin (a bitter aromatic lamellar substance) are both derived from tobacco in all its parts, and are therapeutic agents requiring to be used with the utmost caution; nicotine is also largely contained in the fluid remaining in pipes. It is well-known also as a powerful insecticide. The total quantity of tobacco, manufactured and unmanufactured, imported into the United Kingdom in 1889 amounted to about 79,000,000 lbs., valued at £3,890,000, yielding a customs revenue of £8,858,000. The total quantity of tobacco raised in the United States during 1885 was 562,736,000 lbs., from 752,520 acres, valued at £9,013,666 [J. R. Dodge]. In India 641,000 acres were planted with tobacco. In Hungary during the same year 140,516 acres were devoted to tobacco-culture, the produce being 1,225,400 lbs. The Victorian import during 1887 was 2,488,410 lbs., valued at £252,426 (raw and manufactured).

Niemeyera prunifera, F. v. Mueller. (*Lucuma prunifera, Bentham.*)

The Australian Cainito. An evergreen tree, sparingly dispersed from the north of New South Wales through the coast-forests of Queensland. The fruit is of a plum-like appearance and edible. Culture is likely to improve its quality.

Nuphar multisepalum, Engelmann.

Western North-America. This Water-Lily produces nutritious seeds, which taste like Broom-Corn, and are used locally for food, but are more particularly valuable for waterfowl. Various species of Nymphæa might be utilised in the same manner, irrespective of their value as decorative lake- or pond-plants. The author naturalised the British Water-Lily, Nymphæa alba (Camerarius), in Victoria long ago. The very decorative N. gigantea (Hooker) extends naturally in Eastern Australia to 30° S.

Nyctanthes arbor tristis, Linné.

India. up to Assam. This arborescent shrub or small tree (to 30 feet) may be grown in almost any moist regions, free from frost, for the exquisite fragrance of its flowers, from which essence of jasmin can be obtained.

Nyssa aquatica, Linné.

The Tupelo or Pepperidge. Eastern North-America. This large tree can be grown in pools and deep swamps, and is thus well adapted for aquatic scenery, though the foliage is deciduous. The spongy roots serve as a substitute for cork and the floats of nets.

Nyssa multiflora, Wangenheim.

Eastern States of North-America, where it is called the Forest-Tupelo or Black Gum-tree [Dr. Asa Gray]; also called Sour Gum-tree. Attains a height of about 50 feet. Suited for forest-soil; has horizontal branches and a "light, flat spray, like the Beech." Can be propagated from cuttings. The wood is very hard, but light, and almost unwedgable; it serves for hubs of wheels, pumps, side-boards of carts, trays, bowls, dippers, mortars, wooden shoes, hatters' blocks and various turners' work. The foliage turns bright crimson in autumn. The fruits are pleasantly acidulous, like those of N. capitata (Walter) and of some other species, and often used for preserves.

Nyssa uniflora, Walter.

Eastern States of North-America. The Swamp-Tupelo. Wood soft, whitish; particularly adapted for trays, bowls and carving [C. Mohr], that of the roots very light and spongy, hence used for corks [Dr. Asa Gray]. A shrub or small tree. The mucilaginous fruits are edible.

Ochrocarpus longifolius, Bentham and Hooker.

Western peninsula of India. A middle-sized tree. Fruit rather small, but edible; ripens with Mangosteens still at Mysore, up to 3,000 feet, where the annual rainfall is only about 36 inches [J. Cameron].

Ocimum Basilicum, Linné.

The "Basil." Warmer parts of Asia and Africa. Will grow in Norway to lat. 63° 26′ [Schuebeler]. An annual herb, valuable for condiments and perfumery. Several varieties exist, differing considerably in their scent. A crystalline substance is also obtained from this and similar species. O. canum (Sims) is closely allied. Valuable, like many other aromatic Labiatæ, for bees. Seeds will keep for fully eight years.

Ocimum gratissimum, Linné.

Recorded from India, the South-Sea Islands and Brasil as indigenous. Somewhat shrubby. This is also a scent-plant, like the following, and is one of the best of the genus. O. viride (Willdenow), from tropical Africa, seems a variety. There an infusion of it is administered as a febrifuge.

Ocimum sanctum, Linné.

Arabia, India, tropical Australia. A perennial herb. The odor of the variety, occurring in North-Australia, reminds of anise; the smell of the variety, growing in East-Australia, resembles that of cloves. O. tenuiflorum, L., seems to be another variety. Probably other species, cis- as well as trans-atlantic, can be used like Basil.

Ocimum suave, Willdenow.

East-Africa. A shrubby species.

Ocotea bullata, E. Meyer. (Oreodaphne bullata. Nees).

South-Africa, in humid districts, where it is next to Nageia elata one of the largest timber-trees. Planks 20 feet long and 15 inches wide are occasionally obtained. The wood has such great strength, that it is preferentially used for the heavy waggons of South-Africa; also employed for very durable furniture, especially chairs [W. Tuck].

Œnanthe Phellandrium, Lamarck.

Europe, Western and Northern Asia. A perennial swamp-plant, the fruitlets of which are of considerable medicinal value.

Œnanthe stolonifera, De Candolle.

Japan, China, India, where this swamp-herb is used for spinage. For particulars refer to Paillieux et Bois in Bull. Soc. d'Acclimat. 1888, p. 1106-1108.

Olea Europæa, Linné.*

The Olive-tree. South-Western Asia; naturalised in the countries on the Mediterranean Sea. Generally not of great height, but of many centuries' duration and of unabating fecundity. In Corfu however it grows sometimes to a height of 60 feet, and form

beautiful forests. The well-known olive-oil is obtained from the fruit. Certain varieties of the fruit, preserved in vinegar or salt-liquid before perfectly ripe, are also much used for the table. For this purpose the fruit is generally macerated previously in water containing potash and lime. The gum-resin of the olive-tree serves as incense; it contains the crystalline olivil. The oil of the drupaceous fruit is a most important product of countries with a warm temperate climate. Its chemical constituents are: 30 per cent. crystalline palmitin; 70 per cent. olein, for which reason olive-oil belongs to those kinds, which are not drying. In pressing, the kernels must not be crushed, as then a disagreeable taste will be imparted to the oil. Exceptionally, 2,000 gallons have been obtained in California from an acre [Geo. Chaffey]. In Creta (double the size of Kangaroo-Island) alone the value of olive-oil produced annually amounts at an average to nearly half a million sterling [Dr. Masters]. The wild variety of the olive-tree usually has short blunt leaves and thorny branches. Long-continued droughts, so detrimental to most plants, will affect the olive but slightly. It thrives best on a free, loamy, calcareous soil, even should it be strong and sandy, but it dislikes stiff clay. Proximity to the sea is favorable to it, and hill-sides are more eligible for its culture than plains. The ground must be deeply trenched. Manuring with well-decayed substances is requisite annually or every second or third year, according to circumstances. Irrigation will add to the productiveness of the plant. Captain Ellwood Cooper, of Santa Barbara, Southern California, obtained from orchards 10 years old sufficient fruit for 700 gallons of olive-oil to the acre, one-fourth of the produce paying for the expenses of preparing the soil, gathering the crop, pressing the oil and conveying it to market. He considers olives one of the most profitable crops for Southern California; he has now 80 acres planted with this tree in bearing, from which he annually obtains about 25,000 bottles of oil. Mons. Riordet distinguishes three main varieties, of which he recommends two: 1. The Cayon, a small-sized tree, which comes into bearing after three or four years, but bears fully only every second year; its oil is fine with some aroma. 2. The Pendulier, a larger tree, with long drooping branches, yielding an oil of first-rate quality. Mons. Reynaud, "Culture de l'Olivier," separates twelve varieties, as cultivated in France, and recommends among them: 1. The Courniau or Courniale, also called Plant de Salon, bearing most prolifically a small fruit and producing an excellent oil. 2. Picholine, which by pruning its top-branches is led to spread over eight yards square or more; it is of weeping habit, yields a good oil in fair quantity, and resists the attacks of insects well. 3. The Mouraou or Mourette, a large tree also furnishing oil of a very very fine quality. Professor Naudin's opinion of some of the French varieties is as follows:—1. Laurine, one of the hardiest kinds, much cultivated in Languedoc; the oil is good, but not first-class; the fruit is preserved in some districts. 2. Saurine or Picholine; very fertile; fruit of medium size. 3. Aglandeau,

Cayanne or Cayon; fruit small, but yielding an excellent oil; the tree is small, yet productive, and bears early. 4. Amellone or Plant d'Aix, one of the most frequently cultivated kinds in Provence, giving a first-class oil; the fruit is also preserved. 5. Baralingue or Ampoulleau, one of the good French varieties; the fruit is roundish. 6. Negrette or Mourette, an early variety with very dark fruit; several sub-varieties are cultivated. 7. Saverne, gives an oil of first-rate quality, especially in gravelly and calcareous soil; it does not stand frost so well as most others. 8. Turquoise, produces elongated fruits; one of the best kinds for preserving. 9. Espagnole, one of the largest-fruited Olives of Provence and among the best for preserves; the oil is inferior. 10. Rougette or Ponchude, has fruits pointed at both ends, not getting red till ripe; yields one of the best oils of the country. 11. Pendulière, so named from its drooping habit, renowned for the excellence of its oil. 12. Courniole, Courniau or Plant de Salon, is very productive and yields an excellent oil, but the fruits are too small for preserving. Olive-trees require judicious pruning immediately after the fruit is gathered, when the sap is comparatively at rest. They may be multiplied from seeds, cuttings, layers, suckers, truncheons and old stumps, the latter to be split. They can also be propagated from protuberances at the base of the stem, which can be sent long distances. The germination of the seeds is promoted by soaking the nutlets in a solution of lime and wood-ash. The seedlings can be budded or grafted after a few years. Truncheons or estacas may be from one to many feet long and from one to many inches thick; they are placed in the ground horizontally. Some Olive-plantations at Grasse are worth from £200 to £250 per acre. For many details the tract on the "Culture of Olive and its Utilisation," issued in Melbourne by the Rev. Dr. Bleasdale, should be consulted, as it rests largely on its author's observations during a long stay in Portugal; also the essay of Sir Samuel Davenport in Adelaide, the treatise issued by Capt. Ellwood Cooper in San Francisco, the remarks by Prof. Hilgard in the Bulletin No. 85 and 92 of the Agricultural Experiments, Station, Berkeley, California, February, 1890, and March, 1891, further the notes by Mr. J. L. Thompson, of the Dookie Agricultural College, in the *Leader*, June, 1890, as well as Mr. B. M. Lelong's observations in the *Victorian Farmers' Gazette*, February and April, 1889. The olive will resist considerable frost (5° F.) for a short time, provided that the thawing takes place under fogs or mild rain (or perhaps under a dense smoke). It requires about one-third more annual warmth than the vine for ripening its fruit. The Olive-zones of South-Europe and North-Africa are between 18° and 44° north latitude. An elevation of about 550 feet corresponds in Spain, as far as this culture is concerned, to one degree further north. Mr. Thozet reared already good varieties many years ago in the lowlands just within the tropics of Eastern Australia, where they bear freely and produce an excellent oil. Olives do not grow well on granitic soil, nor

bear well on light soil. The fruit produced on limestone-formations is of the best quality. Gypsum promotes the growth of the tree. An equable temperature serves best; hence exposure to prevailing strong winds is to be avoided. The winter-temperature should not fall below 19° F. The quantity of oil in the fruit varies from 10 to 20 per cent.; sometimes it even exceeds the latter proportion. In Provence on an average 24 lbs. of olive-oil are consumed by each individual of the population annually; in Andalusia, about 30 lbs. G. Don mentions an aged tree near Gerecomio to have provided olives for 240 quarts of oil in one year. For obtaining the largest quantity of oil the fruit must be completely ripe. Hand-picked olives give the purest oil. Knocking the fruit from the branches with sticks injures the tree and lessens its productiveness the next year. No heat should be used in the extracting and purifying of the oil. To preserve the oil well, it should not be exposed to light. Spain alone produces about 250,000,000 lbs. of olive-oil a year. The imports of olive-oil into the United Kingdom in 1884 amounted to 17,000 tons, valued at £715,000; in 1889 the quantity was 22,882 tons, valued at £817,000. The import into Victoria during 1887 was estimated at £10,919.

The following notes are derived from the important "Tratado del Cultivo del Olivo en Espana," by the Chev. Capt. Jose de Hidalgo-Tablada (second edition, Madrid, 1870).

Spanish Varieties.

A.—Varieties of early maturation, for colder localities:—

1. Var. *Pomiformis*, Clem.
   Manzanillo. (French: Ampoulleau.) Fruit above an inch in diameter, spherical, shining black. Putamen broad and truncate.

2. Var. *Regalis*, Clem.
   Sevillano. (French: Pruneau de Catignac.) Fruit about an inch in diameter, ovate-spherical, blunt, bluish-black.

3. Var. *Bellotudo* or *Villotula*.
   Fruit about an inch long, egg-shaped; pericarp outside dark-red, inside violet.

4. Var. *Redondillo*.
   Fruit ovate-spherical, nearly an inch long. Pericarp outside bluish-black, inside whitish. A rich yielder.

5. Var. *Ovalis*, Clem.
   Lechin, Picholin, Acquillo. (French: Saurine.) Fruit broad-oval, two-thirds of an inch long. A copious yielder.

6. Var. *Argentata*, Clem.
   Nevadillo blanco; Doncel; Zorzalena; Moradillo; Ojiblanco; Olivo lucio. Fruit broad-ovate, an inch long, very blunt, not oblique. Quality and quantity of oil excellent.

7. Var. *Varal blanco.*

(French: Blanquette.) Fruit ovate-globular, three-fourths of an inch long, neither pointed nor oblique, outside blackish-red.

8. Var. *Empeltre.*

Fruit ovate, an inch long, equable. Rich in oil of excellent quality; also one of the best sorts for pickles. Pericarp outside violet, inside whitish.

9. Var. *Racimal.*

(French: Bouteillan, Boutiniene, Ribien, Rapugette.) Fruit violet-colored, globose, ovate, about an inch long; neither pointed nor oblique. Bears regularly also on less fertile soil, and is one of the earliest to ripen.

10. Var. *Varal negro.*

Alameno. (French: Cayon, Nasies.) Fruit violet-black, spotted, globose-ovate, nearly an inch long, somewhat pointed. Bears richly.

11. Var. *Colchonuaa.*

Fruit spherical, outside red, inside whitish, an inch in diameter slightly pointed. Produces a large quantity of good oil.

12. Var. *Ojillo de Liebre.*

Ojo de Liebre. Fruit nearly spherical, outside violet-black, about one inch long, somewhat oblique. One of the less early varieties.

13. Var. *Carrasquena.*

(French: Redouan de Cotignat.) Fruit black-red, almost spherical, about an inch long. Valuable both for oil and preserves, but liable to be attacked by various insects.

14. Var. *Hispalensis*, Clem.

Gordal; Ocal; Olivo real. Fruit black-grey, nearly spherical, slightly oblique, measuring about an inch. Rather large and quick-growing tree. Fruit used in the green state for preserves, not used for table-oil.

15. Var. *Verdegc*,

Verdial. (French: Verdal, Verdan.) Fruit black-violet, oblique. spheric, pointed, about one inch long. Furnishes good oil and resists the cold best of all.

B.—Varieties of late maturation, for warmer localities:—

16. Var. *Maxima*, Clem.

Madrileno; Olivo morcal. Fruit over an inch long, cordate-globose, strongly pointed. Less valuable for oil than for preserves.

17. Var. *Rostrata*, Clem.

Cornicabra. (French: Cournaud, Corniaud, Courgnale, Pl. de Salon; Pl. de la Fane; Cayon Rapunier, Grasse.) Strong and tall, less tender; fruit blackish-red, over an inch long, oval, much pointed, good for oil.

18. Var. *Ceratocarpa*, Clem.

Cornezuelo. (French: Odorant, Luquoise, Luques.) Fruit fully an inch long, oval, pointed.

19. Var. *Javaluno.*

Fruit black-grey, over an inch long, egg-shaped, somewhat oblique, gradually pointed. Rich in good oil; can also be chosen for preserves; much subject to attacks of insects.

20. Var. *Picudo.*

Fetudilla, Fruit fully an inch long, egg-shaped, blunt at the base, pointed at the apex, with black-grey pulp. Pericarp easily separable. Employed both for oil and preserves.

21. Var. *Nevadillo negro.*

Fruit egg-shaped, fully an inch long, with turned pointed apex. One of the richest of all varieties in yield. Endures considerable cold, and is not late in ripening.

All these Spanish varieties show rather long, lanceolate leaves of more or less width.

French Varieties.

(Some verging into the Spanish kinds.)

22. Var. *Angulosa*, Gouan.

Galliningue, Laurine. For preserves.

23. Var. *Rouget.*

Marvailletta. Produces a fine oil.

24. Var. *Atrorubens*, Gouan.

Salierne, Saverne. Fruit dusted-white. Furnishes one of the best of oils.

25. Var. *Variegata*, Gouan.

Marbrée, Pigale, Pigau. Fruit purple, with white spots.

26. Var. *Le Palma.*

Oil very sweet, but not largely produced.

27. Var. *Atrovirens* Ros.

Pointue, Punchuda. Fruit large, with good oil.

28. Var. Rubicans, Ros.

Rougette. Putamen small. Yield annual and large.

29. Var. *Alba*, Ros.

Olive blanche, Blancane, Vierge. This, with many others omitted on this occasion, is an inferior variety.

30. Var. *Caillet Rouge.*

Figanier. Small tree. Fruit large, red. Oil good and produced in quantity.

31. Var. *Caillet blanc.*

Fruit almost white, produced annually and copiously, yielding a rather superior oil.

32. Var. *Raymet.*

Fruit large, reddish. Oil copious and fine. This variety prefers flat country.

33. Var. *Cotignac.*

Pardigniere. Fruit middle-sized, blunt. Oil obtained in quantity and of excellent quality. This requires much pruning.

34. Var. *Bermillaon.*

Vermillaon. Yields table-oil and resists cold well.

This list was several years ago without permission copied into an official publication in another part of the globe, and without any allusion to Capt. Hidalgo-Tablada or the translator.

Many other apparently desirable varieties occur, among which the Italian Oliva d'Ogni Mese may be mentioned, which ripens fruit several times in the year, and furnishes a pleasant oil and also fruit for preserves.

Oncosperma fasciculatum, Thwaites.

Ceylon. This Palm ascends there to 5,000 feet. The very slender but prickly stem attains a height of 50 feet. Desirable for scenic culture.

Onobrychis sativa, Lamarck.*

The "Sainfoin, Esparsette or Cock's-head" Plant. Southern and Middle Europe, South-Western and Middle Asia. Hardy in Norway to lat. 63° 26′ [Schuebeler]. A deep-rooting perennial fodder-herb, fond of marly soil, and living in dry localities. It prepares dry calcareous soil for cereal culture. Stagnant underground-humidity is fatal to this plant. It prospers even where Red Clover and Lucerne no longer succeed, and is richer in nutritive constituents than either, as shown already by Sir Humphrey Davy. The yield is at its maximum in the third year;

cannot well be cut repeatedly in the season [Dr. Stebler]. Sheep cannot be turned out so well on young Sainfoin-fields as cattle. The hay is superior even to that of Lucerne and Clover. The plant will hold out from five to seven years [Langethal]. It yields much honey for bees. O. montana (De Candolle) is a dwarfer sub-alpine variety of limestone-regions. O viciæfolia (Scopoli), is the earliest name for this species.

Onosma Emodi, Bentham. (*Maharanga Emodi,* A. de Candolle.)

Nepal. The root, like that of the Alkanna tinctoria, produces a red dye.

Ophiopogon Japonicus, Ker. (*Flueggea Japonica,* Richard.)

The mucilaginous tubers can be used for food, a remark which applies to many other as yet disregarded allied plants.

Opuntia coccinellifera, Miller.

Mexico and West-Indies. The Cochineal-Cactus. On this and O. Tuna, O. Hernandezii and perhaps a few others subsists the Coccus, which affords the costly cochineal-dye. Three gatherings can be effected in the year. About 1,200 tons used to be imported annually into Britain alone, and a good deal to other countries, valued at about £400 per ton. The precious carmin-pigment is prepared from cochineal. Different Cochineal-Opuntias occur in Argentina also. Some species of Opuntia will endure a temperature of 14° F.; one even advances to 50° north latitude in Canada. Mr. Dickinson observes, that many species are hardy at Port Phillip, growing even in sand, overtopping by 10 feet the Leptospermum lævigatum, and breaking it down by their great weight within a few yards of the sea. Mr. R. G. Ely, of Keilor, draws attention to the fodder-value of Opuntias, after freeing them by an easy method of his own from prickles and hairlets. Mr. A. N. Pearson shows a fair proportion of nutritive substance to be contained in these kinds of plants. They would best serve in almost rainless regions, remaining sappy at all times.

Opuntia Dillenii, De Candolle.

Central America. A Tuna-like Cactus, serving for uninflammable hedges, and perhaps also for the rearing of the *Coccus Cacti.* It is particularly eligible for barren land, but apt to stray beyond bounds in hot countries.

Opuntia elatior, Miller.

Central America. A hedge-plant with formidable thorns.

Opuntia Ficus Indica, Miller.

Called inaptly, with other congeners, Indian Fig. Central America, north as far as Florida. Serves for big hedges. Pulp of fruit edible. Exudes a gum, somewhat like Tragacanth.

Opuntia Hernandezii, De Candolle.

Mexico. Also affords food for the *Coccus Cacti.*

Opuntia Missouriensis, De Candolle.

From Nebraska to New Mexico. Very hardy. Professor Meehan found this Cactus covered with the Cochineal-Coccus, and points to the fact, that this insect will live through the intense cold, which characterizes the rocky mountains of the Colorado-regions.

Opuntia Rafinesquii, Engelmann.

A prickly Pear of North-America. The most northern of all species, extending to Lake Michigan. It resists severe frosts, as do also O. brachyantha, O. Comanchica, O. humilis [Mayer] O. Whipplei, O. oplocarpa, O. arborescens and Mammillaria Missouriensis [Loder, Meehan].

Opuntia spinosissima, Miller.

Mexico and West-Indies. Stem columnar, with pendent branches. Also a good hedge-plant. Harding recommends for hedges, besides these species, O. maxima (Miller) as the most repellent.

Opuntia Tuna, Miller.

West-Indies, Ecuador, New Granada, Mexico. Irrespective of its value as a principal cochineal-plant, this cactus is also of use for hedges. It will attain a height of 20 feet. The pulp of the fruit is edible. With many other species hardy anywhere in Australia down to the south-coast. Of Cochineal Great Britain imported in 1884 14,100 cwt., value £80,000.

Opuntia vulgaris, Miller.

The ordinary "Prickly Pear." Central America, northward to Georgia, southward to Peru. Very hardy. Adapted for big hedges, and like the rest not inflammable, hence particularly valuable along railway-lines. The fruit almost smooth, eatable. A dye can also be prepared from its pulp and that of allied species. Numerous other species are industrially eligible for hedging purposes, but sometimes spreading much beyond control, particularly in warm climes. Don F. de la Camera states, that in rocky ground at Malaga, the fruits on fermentation and distillation give about 6 per cent. alcohol. During seasons of drought the fruits are sought for aiding in the feeding of cattle. Dr. Porcher found, that through prickly pears the tallow for candlemaking can be more hardened. See also notes in Dyer's Kew Bulletin, 1888, p. 170–171, on various uses of Opuntias. In Texas, Cactese of many sorts are thoroughly scorched, and then cut up for dairy-feed, given along with other sustenance.

Oreodoxa frigida, Humboldt.

Central America, ascending the Andes to 8,500 feet. This dwarf slender Palm may be chosen for domestic decoration.

Oreodoxa oleracea, Martius.

West-Indies, up to nearly 5,000 feet elevation. One of the most rapid growing of all Palms, rising to a height of 120 feet. In highly manured moist ground the Palm-Cabbage, which in this species is of exquisite nut-flavor, can be obtained in two years [Imray, Jenman], should ever such a culture become desirable. Hardy in Florida [B. Smith].

Oreodoxa regia, Humboldt.

West-Indies. This noble palm attains a height of 60 feet. It has proved hardy in Southern Brazil. The stem is thickened at the middle, and from it, as from that of O. oleracea, starch can be obtained. Found to be of easy growth and drought-resisting in South-Queensland.

Origanum Dictamnus, Linné.

Candia. Like the following, a scent-plant of somewhat shrubby growth. With O. vulgare in medicinal use since Hippocrates' time.

Origanum Majorana, Linné.

North-America, Middle Asia, Arabia. A perennial herb, used for condiments, also for the distillation of its essential oil, much employed in French factories of scented soap [Dr. Piesse]. In Norway it will grow to lat. 70° 22′ [Schuebeler].

Origanum Maru, Linné.

Palestine. Perennial and very odorous.

Origanum Onites, Linné.

Countries at and near the Mediterranean Sea. Somewhat shrubby and strongly scented.

Origanum vulgare, Linné.

The ordinary Marjoram. All Europe, North-Africa, Northern and Middle Asia. In Norway it is indigenous to lat. 66° 16 [Schuebeler]. A scented herb of perennial growth, containing a pleasant volatile oil. It prefers limestone-soil. Of importance also as a honey-plant. O hirtum (Link), O virens (Hoffmannsegg) and O. normale (D. Don), are closely allied plants of similar use. Several other Marjorams, chiefly Mediterranean, are of value. Their seeds maintain vitality for a few years.

Ornithopus sativus, Brotero.

South-Europe and North-Africa. "The Seratella or Serradella." An annual herb, larger than the ordinary Bird's-foot clover, O. perpusillus, L. It is valuable as a fodder-plant on sterile particularly moist and sandy soil. It requires no lime, but improves in growth on such, especially gypsum-land. Particularly rich in digestible protein. Dr. Goessmann found in Pennsylvania the total of two cuts to be in a season 11½ tons green fodder, equal to nearly 3 tons dry on an acre. A good honey-plant. It matures seeds near Christiania [Schuebeler]. Has done particularly well in Hawaia.

Oryza latifolia, Desvaux.

Wild in Central America, but perhaps of Asiatic origin. This species is said to be perennial and to attain a height of 18 feet. It deserves trial culture, and may prove a good fodder-grass on wet land in warm localities. O. perennis (Moench) seems closely allied. Bentham and J. Hooker are not inclined to admit more than one species of Oryza. The present one is however maintained by Grisebach.

Oryza sativa, Linné.*

The Rice-Plant. South-Asia and North-Australia. Annual like most cereals. Many rivulets in ranges afford ample opportunities for irrigating rice-fields; but these can be formed with full advantage only in the warmer parts of extra-tropic countries, where rice will ripen as well as in Italy, China or the Southern States of the American Union. In Persia it grows up to 8,000 feet. Among the numerous varieties of Indian rice may be noted as prominent sorts: The Early Rice (O. præcox, Loureiro), which ripens in four months and is not injured by saline inundations; the hardier Mountain-Rice (O. montana, Loureiro), which can be raised on comparatively dry ground, and which actually perishes under lengthened inundation, but which is less productive; the Glutinous Rice (O glutinosa, Loureiro) which succeeds as well in wet as in almost dry places, and produces black or reddish grains. Mr. H. A. Wickham recommends the Brazilian and the Carolina varieties for Australia, as most prolific, and as least troublesome in their culture. In the rich plains of Lombardy, irrigated from the Alps, the average crop is estimated at forty-eight bushels for the acre annually. According to General Capron the average yield in Japan is fifty bushels per acre, while on the Manning River, in N.S.W., 60 bushels were obtained. The spirit, distilled from rice and its molasses, is known as arrack. Rice-beer, known as "Sake," is extensively brewed in Japan, and is the principal fermented beverage used by the inhabitants; thus, according to the "Journal of the Society of Arts," about 150 millon gallons are consumed annually. Rice-starch is now consumed in enormous quantities,

particularly in Britain. Nearly 330,000 tons of rice to the value of £2,690,000 were imported into the United Kingdom in 1889. The colony Victoria during 1887 imported 5,738 tons, valued £80,997. The export from India during 1886 was estimated to have been about £9,000,000 [Dr. G. Watt]. Rice-sugar, called "Ame" in Japan, constitutes there a kind of confectionery. For sanitary reasons it is preferable to cultivate the mountain-rice, when that is possible.

Oryzopsis cuspidata, Bentham.

South-Western parts of North-America. A perennial grass of easy dissemination. Tufts dense, hence one of the Bunch-grasses; thrives on soil too sandy and too dry for more valuable grasses [Dr. Vasey].

Oryzopsis multiflora, Bentham. (*Milium multiflorum,* Cavanilles; *Piptatherum multiflorum,* Beauvois).

Countries around the Mediterranean Sea, thence to Middle Asia, also Madeira and Canary-Islands, northwards to Tyrol. This tall perennial grass grows naturally in the driest of localities [Prof. Caruel]. No other grass at St. Vincent's Gulf grows so luxuriantly with so little water and exposed to so great a heat [Hon. R. A. Tarlton].

Oryzopsis panicoides, Bentham. (*Piptochætium panicoides,* E. Desvaux.)

Extra-tropical South-America. This with some congeners affords good pasturage in Chili and the La Plata-States [Hieronymus].

Osmanthus fragrans, Loureiro.

China and Japan. The flowers of this bush serve for oil-distillation like those of the Jasmine. The scent of one plant will perfume a whole conservatory [G. W. Johnson].

Osmitopsis asteriscoides, Cassini.

South-Africa. A camphor-scented shrub, much in use there for medicinal purposes [Dr. Pappe].

Ostrya carpinifolia, Scopoli.

"The Hop-Hornbeam." South-Europe and Orient. A deciduous tree, reaching 60 feet in height. Uses much like those of the following.

Ostrya Virginica, Willdenow.

"Lever-wood" Tree of Eastern States of North-America, also Mexico. Occasionally called Iron-wood; to 40 feet high, in rich woodlands. Wood singularly hard, close-grained and heavy, in use for levers, mill-cogs, wheels, mallets, wedges and other implements. Cattle browse on the foliage. The growth of the tree is very slow.

Osyris compressa, A. de Candolle.

South-Africa. One of the most valuable tans for finer leathers is provided there by the leaves and young twigs of this shrub or small tree. The bloom obtained from this tan is much like that imparted by Sumach.

Owenia venosa, F. v. Mueller.

Queensland; called locally Sour-Plum. A tree, approaching finally 40 feet in height, furnishing a wood of great strength. O. acidula, F. v. M., the "Rancouran," is a handsome tree, 50 feet high, with close-grained, nicely-marked wood. Culture might improve the fruits.

Oxalis crassicaulis, Zuccarini.

Peru. This seems one of the best of those Wood-Sorrels, which yield a tuberous edible root. Amongst others, O. tuberosa (Molina) and O. succulenta (Barneaud) from Chili, as well as O. carnosa (Molina) and O. conorrhiza (Jacquin) from Paraguay, might be tried for their tubers.

Oxalis crenata, Jacquin.

Peru and Bolivia. There the tubers largely consumed; they lose their acidity by being exposed to the sun, becoming sweet, and contain a good deal of starch [Vilmorin].

Oxalis Deppei, Loddiges.

Mexico. The tubers of this Wood-Sorrel resemble small parsnips, and are not at all acid. The plant undergoes regular cultivation in some parts of its native country, and succeeds well in the south of England [Chambers]. In Prof. Meehan's *Gardener's Monthly*, August, 1884, an Oxalis is mentioned as cultivated in California which produced from one original root as much as 150 tubers in a season, their form being pear-like.

Oxalis esculenta, Otta and Dietrich.

"Spurious Aracacha." Mexico, there, with the preceding species and O. tetraphylla (Cavanilles), O. violacea (Linné) and several others, producing tuberous, starchy, wholesome roots; the first mentioned gives the largest yield. Propagated by subdivision of the root-stock. It requires a deep, rich, moist soil. In Norway it can be grown to lat. 70° [Schuebeler]. As similarly useful may be noted, among many others, O. enneaphylla (Cavanilles) from the Falkland-Islands and Maghelhaen's Straits.

Oxytropis pilosa, De Candolle. (*Astragalus pilosus,* Linné.)

Europe, West-Asia. This perennial plant furnishes fair pasture-herbage; it is deep-rooted and content with almost absolute sand;

the numerous other species—24 alone enumerated as Oriental by Boissier—should be tested. All these plants might be classed as Astragals. They as a rule are satisfied with poor soil.

Pachyma Cocos, Fries.

The Tuckahoe-Truffle or Indian Bread. North-America and East-Asia.

Pachyma Hœlen, Fries.

China. This large truffle occurs particularly in the province of Souchong. Flavor most agreeable. Naturalisation elsewhere to be tried.

Pachyrrhizus angulatus, Richard.* (*Dolichos bulbosus,* Lamarck.)

From Central America rendered spontaneous in many tropical countries. A climber, the horizontal starchy roots of which attain a length of 8 feet and a thickness of many inches. Dr. Peckolt records tubers of 70 lbs. weight. They keep in dry ground, growing for five years, but such are then available only for starch, whereas annual tubers are the most palatable and yield 6 to 7 per cent. of starch. From the stems a tough fibre is obtained. The plant proved hardy at Sydney; it requires rich soil.

Pachyrrhizus tuberosus, Sprengel. (*Dolichos tuberosus,* Lamarck.)

The Yam-bean or Ahipa of Venezuela and other parts of South-America up to elevated country. Climbing to a height of 20 feet. Pods much larger than those of P. angulatus, in a young state serving like French beans, when boiled tender and sweetish, but deleterious when raw [Trimen, Dyer]. They are free from fibrous strings at the edge. Seeds variable in color. The tubers of three plants may fill a bushel-basket [Macfadyen]; they mature within some few months.

Palaquium Gutta, Baillon and Burck.* (*Dichopsis Gutta,* Bentham; *Isonandra Gutta,* Hooker.)

The "Gutta-Percha" or the "Gutta-Taban" Tree. Malayan Penisula and Sunda-Islands. Attains a height of 150 feet. It seems not altogether hopeless to render this highly important tree a denizen of the mildest wood-regions in temperate climes, Murton having traced it to elevations of 3,500 feet. Indeed, the plant will live in the clime of Port Phillip without protection. The milky sap, obtained by ringing the bark at 5 to 15 inches interstices, is heated for an hour before gradual exsiccation, otherwise the product becomes brittle; 5 to 20 catties yielded by one tree. Genuine Gutta-percha is only got from plants of the sapotaceous order, as far as hitherto known. Besides Palaquium Gutta, which yields the best red Gutta-percha of Borneo, but is slow of growth, the following are actually drawn into use for obtaining this gum-

resin :—Imbricaria coriacea A. de Candolle; Mimusops Elengi, L.; M. Manilkara, G. Don; Sideroxylon attenuatum, D. C., Illippe (Bassia) sericea, Blume; Payenia macrophylla, P. Leeri (which affords the Sundek-Gutta in brackish coast-lands, as shown by Dr. Trimen) and P. Maingayi, Cl.; Palaquium obovatum, P. polyanthemum, P. Krantzianum, Burck; Cocosmanthus macrophyllus, Hassk., all from tropical Asia; Chrysophyllum Africanum, A. de Candolle, from tropical Africa; Achras sapota, L., Mimusops globosa, Gaertner, from Central America; but many of these at often cool elevations. Possibly other sapotaceous trees, including some Australian, could be worked for Gutta-Percha. Of this article 62,000 cwt. were introduced into Great Britain in 1884, valued at £462,000, in 1889 the import amounted to 48,000 cwt., worth £575,000, of which quantity this Palaquium must have supplied a large proportion. Pierre, after the indications of Bentham, adopts the generic name Palaquium, and adds as Gutta-Percha yielding: Palaquium Malaccense, P. Oxleyanum, P. formosum, P. princeps and P. Borneense, all previously undescribed species, either from Malacca or Sumatra or Borneo (see Bulletin mens. de la Soc. Lin. de Paris, Juin, 1885). Dr. Burck admits among Sunda-Island Gutta-Percha trees as really valuable only Palaquium oblongifolium (the most frequent and the best), P. Borneense, P. Treubei, the original P. Gutta being as a native plant almost annihilated. P. ellipticum (Bassia elliptica, Dalzell) ascends to the almost temperate elevations of 4000 feet, and is tapped for Pala, a substance allied to Gutta Percha [General Cullen].

Paliurus ramosissimus, Poiret. (*P. Aubletia,* Schultes.)

China and Japan. A thorny tree, which could be utilised for hedging.

Paliurus Spina Christi, Miller. (*P. aculeatus,* Lambert.)

The Christ-Thorn. From the Mediterranean Sea to Nepal. A deciduous bush or finally tree, which can be trimmed into hedges.

Pandanus furcatus, Roxburgh.

This Screw-Pine occurs in India, up to heights of 4,000 feet, according to Dr. S. Kurz; hence it will be likely to bear a temperate clime, and give a stately plant for scenic group-planting. P. pedunculatus, R. Br., occurs in East-Australia as far south as 32°, and an allied tall species (P. Forsteri, Moore and Mueller) luxuriates in Howe's Island.

Panicum agrostoides, Muehlenberg.

North-America. One of the hardiest species, bearing the winter-cold of New York. Can be utilised for muddy banks and undrained marshy meadows. Easily disseminated, forming large tall clumps, flowering as well from the joints as top; yields abundance of hay, but must be cut while young [Dr. Vasey].

Panicum altissimum, G. Meyer. (*P. elatius,* Kunth.)

From Mexico to Brazil. An almost woody species of arborescent habit, attaining a height of 30 feet. Panicles sometimes a foot and a half long. Evidently desirable for naturalisation.

Panicum amarum, Elliot.

Eastern North-America. A perennial species, fit to be grown on drifting coast-sand.

Panicum atro-virens, Trinius. (*Isachne Australis,* R. Brown.)

South-Asia, East-Australia and New Zealand. A perennial grass, not large, but of tender nutritive blade, particularly fitted for moist valleys and woodlands.

Panicum barbinode, Trinius.

Brazil. Valuable as a fodder-grass. Passes also as Para-grass.

Panicum brizanthum, Hochstetter.

From Abyssinia to Nepal. A large-grained perennial Millet-Grass.

Panicum coenicolum, F. v. Mueller.

Extra-tropic Australia. Valuable as an enduring grass for moist meadows.

Panicum compositum, Linné. (*Oplismenus compositus,* Beauvois.)

South-Asia, East-Australia, Polynesia, New Zealand. The growth of this soft-bladed and prolific grass should be encouraged in forest-ground.

Panicum Crus Galli, Linné.*

The "Barnyard- or Cockshin-Grass." Occurring now in all warm countries, but probably of far oriental origin, as it seems not recorded in our ancient classic literature. A rich but annual grass of ready spontaneous dispersion, particularly along sandy river-banks, also around stagnant water. P. colonum, L. and P. Crus Corvi, L. are varieties of it. Regarded by R. Brown as indigenous in Eastern and Northern Australia, where many other excellent fodder-species occur, some perennial. It will succeed also on somewhat saline soil, particularly on brackish water-courses, likewise on moor-land. For rural rearing the short-awned variety should be chosen. On the Lower Mississippi it has furnished as much as four or even five tons of hay from one acre. Noticed in Japan already by the early European travellers. Had the Alexandrian Library not been burnt, some clue as to the real place of the origination of this grass and many other plants might have been, been obtained. Cows and horses are very fond of this grass whether fresh or dry [Professor Phares]. P. hispidulum, Retzius, which accords with the Cockshin-Grass in prolific growth and nutritiveness, prefers moist situations.

Panicum decompositum, R. Brown. (*P. lævinode,* Lindley.)*

The Australian Millet. One of the most spacious of Australian nutritious grasses. The aborigines convert the small millet-like grains into cakes. It is the only grain stored by the nomads of Central Australia. This grass will thrive on poor soil with Eleusine cruciata (Lam.), coming to maturity after rains in one month in the torrid regions of Central Australia [Rev. H. Kempe]. Hardly different from the North-American P. capillare, L., except in perennial roots. The allied P. trachyrrhachis (Bentham) from North- and East-Australia also constitutes a very good pasture-grass. Of similar value the exclusively Australian P. effusum, R. Br. They are among the few nutritious grasses fit for hot and arid desert-tracts. Known to have grown after summer rains, within 5 weeks, to 3 feet into flowering.

Panicum distichum, Lamarck. (*P. pilosum,* Swartz).

Tropical Asia, Africa and America, Polynesia. This perennial grass is mentioned by Kurz among those yielding grain for human food in India.

Panicum divaricatissimum, R. Brown.

Australia, particularly in the warmer inland-regions. A good perennial grass, of easy growth on poor soil.

Panicum divaricatum, Linné. (*P. bambusoides,* Hamilton.)

Central and Southern America. A grass of scandent habit, ascending high up in trees ; desirable for naturalisation in forests.

Panicum enneaneurum, Grisebach.

La Plata-States. Prof. Hieronymus mentions this along with P. grumosum (Nees), P. laxum (Swartz), P. oblongatum (Grisebach) and P. rivulare (Trinius) as rendering the Pampas-pastures so nutritive.

Panicum flavidum, Retzius.

Southern Asia, tropical and Eastern sub-tropical Australia. A prolific seed-bearer, often prostrated by the weight of the seeds.

Panicum fluitans, Retzius.

Tropical Asia and Africa. This perennial grass, like P. spinescens (R. Brown) of East-Australia, ought to be naturalised along lakes, lagoons and rivers, particularly for the benefit of waterfowl.

Panicum foliosum, R. Brown.

India, East-Australia. Perennial. Mr. Bailey finds this to be one of the best grasses for river-banks. Refer for further information on this and other Q.L. grasses to his and Staiger's illustrated monography.

Panicum frumentaceum, Roxburgh.*

The "Shamalo- or Deccan-grass." Probably introduced from tropical Africa into South-Asia. A hardy summer-grass, having matured seeds even at Christiania [Schuebeler]. It serves as a fodder-grass and produces also a kind of millet. In warm moist climes it ripens grains in $1\frac{1}{2}$ months from the time of sowing. The grain much recommended by Mr. C. B. Taylor for culinary purposes.

Panicum Italicum, Linné.* (*Setaria Italica,* Beauvois).

This grass, notwithstanding its name, is also of Asiatic origin, ascending the Himalayas to 6,500 feet, extending to China and Japan. It even ripens in cold climes, its seeds coming to perfection as far north as Christiania [Schuebeler]. Reared in Switzerland since pre-historic ages; one of the five kinds of plants, sown ceremoniously each year by the Emperor of China, according to an Imperial custom initiated 2,700 years before the Christian era [A. de Candolle]. It is annual, attaining a height of 5 feet, and is particularly worthy of cultivation as a tender green fodder. In warm climes it can be had all through the year, according to the time of sowing; preferentially grown in many parts of East-Australia for stable-animals, producing in the litoral regions there very heavy crops. It keeps weeds down, and is one of the most valuable of soiling plants; withstands drought well; yields early in the season a heavy crop of excellent hay, which dries easily [C. Mohr]. The abundantly produced grain is not only one of the best for poultry, but that of some varieties can be utilised as millet; considered by many a delicious grain for cakes and porridge. The Brahmins hold it in higher esteem than any other grain [Dr. Ainslie]; called in many places "Hungarian Millet." P. Germanicum (Roth) is a form of this species. Allied are also the West-Indian Panicum (Setaria) magnum (Grisebach), which attains a height of 10 feet on margins of lagoons, and Panicum macrostachyum (Nees) of East-Australia, South-Asia and tropical America, the latter species highly praised by Mr. R. L. Holmes in Fiji and by Prof. Hieronymus in Argentina.

Panicum Koenigii, Sprengel. (*P. Helopus,* Trinius.)

Tropical and sub-tropical Africa, Asia and Australia. A good fodder-grass, broad-bladed, in N. W. India especially lauded by Duthie, along with P. antidotale (Retzius).

Panicum latissimum, Mikan.

Brazil. A highly ornamental grass. Leaves extremely broad, but hard; panicle very rich.

Panicum maximum, Jacquin.* (*P. jumentorum,* Persoon.)

The Guinea-grass. Tropical Africa; elsewhere not indigenous. This perennial grass attains a height of 8 feet. It is highly nutritious, and quite adapted for the warmer temperate zone, being hardy as far south as Buenos Ayres. In Jamaica it is the principal fodder-grass up to elevations of 5,000 feet, springing up over wide tracts of country almost to the exclusion of everything else. It forms large bunches, which when cut young supply a particularly sweet and tender hay; throws out numerous stolons; can be mown every six weeks; the roots can be protected in the ground against light frosts by a thin covering with soil. A favorite grass in tropical countries for stall-fodder. The best fodder-grass raised on the plains of India. Will exceptionally grow 6 inches in a day. It is necessary to guard against over-feeding with this grass solely. Succeeds even on poor clay-soil and on sea-sand. P. bulbosum (Kunth) is a more hardy grass of the southern parts of North-America, regarded as a variety by General Munro, but remarkable for its thickly enlarged roots.

Panicum melananthum, F. v. Mueller.

Eastern Australia. A valuable perennial grass for pastoral purposes [Bailey]. Adapted also for shady localities. Eligible for irrigation-ground.

Panicum miliaceum, Linné.* (*P. miliare,* Lamarck.)

The true "Millet." South-Europe, North-Africa, South-Asia, ascending the Himalayas to 11,000 feet, North-Australia. Cultivated in Southern Europe as early as the time of Hippocrates and Theophrastus, in Egypt prior to historic records and in Switzerland during the stone-age. Annual, attaining a height of four feet. Several varieties occur, one with black grains. They all need a rich and friable soil, also humidity. Maturation very quick. It is one of the best of all grains for poultry, but furnishes also a palatable and nutritious table-food. A syrup is prepared from the seeds in Siberia [A. Regel]. It ripens even in Christiania [Schuebeler]. In mild countries as many as 70 bushels of seeds have been harvested from an acre of land, well cultivated with this grass [Ch. Flint].

Panicum molle, Swartz.* (*P. sarmentosum,* Roxburgh.)

Warmer parts of America, Africa and Asia. One of the Para grasses. A perennial, very fattening pasture-grass, of luxuriant growth, attaining a height of 6 feet [Grisebach]. It is hardy the Cape of Good Hope and other far extra-tropic regions.

Panicum myurus, Lamarck.

Tropical Asia and America, North-Eastern Australia. A perennial aquatic grass, with broad-bladed foliage, fit for ditches and swamps. Regarded by Mr Bailey as very palatable and nutritious to stock.

Panicum obtusum, Humboldt.*

The Mosquito- or Mezquite-grass of Mexico. Perennial, nutritious; has strong running stems, which at distances of two or three feet take root, and send up leafy bunches. Dr. Vasey thinks that this grass will show great endurance in droughty seasons.

Panicum parviflorum, R. Brown.

East-Australia. On dry hills a fine pasture-grass. P. bicolor and P. marginatum, R. Br. are likewise enumerated by Mr. Bailey among the nutritious grasses of East-Australia.

Panicum proliferum, Lamarck.*

Southern parts of North-America. Recorded by Steudel as perennial, by Chapman and others as annual. Evidently one of the hardier species, particularly eligible for wet brackish ground [Prof. A. Gray]. Vegetates luxuriantly in the hottest part of the summer, the stems lengthening sometimes to 7 feet, soon bending and then rooting from the lower joints, throwing out numerous shoots from them, which grow rapidly, allowing of repeated cutting; stems thick, succulent, sweetish, panicles to 2 feet long. Through all stages of its growth this grass is much relished by horses and cattle [Dr. C. Mohr].

Panicum prolutum, F. v. Mueller.

South-Eastern Australia. Flourishes in the hottest weather; bears a large panicle of seed.

Panicum prostratum, Lamarck. (*P. setigerum,* Retzius.)

Egypt, South-Asia, North-Australia, perhaps also indigenous to tropical America. Perennial. Recommendable for pastures.

Panicum pygmæum, R. Brown.

East-Australia. Forms a soft, thick, carpet-like verdure in forest-shade [Bailey], thus seemingly eligible as a lawn-grass.

Panicum repens, Linné.

Near the Mediterranean Sea, also in South-Asia and North-Australia. Regarded by the Cingalese as a good fodder-grass. It is

perennial and well suited for naturalisation on moist soil, river-banks and swamps. P. coloratum, L., seems a variety of purplish color, and is therefore used ornamentally in vases.

Panicum roseum, Steudel.* (*Tricholæna rosea,* Nees).

South-Africa. This perennial pretty grass promises to become with others of the section Tricholæna valuable for meadows in mild climes. It gets about 2 feet high. Mr. Danger counted nearly 300 stems on one plant in Gippsland; grows there most vigorously, densely covering meadow-ground, much relished by stock. Well calculated to increase the natural provender on runs. In Fiji it reaches a height of 4 feet; it rises most readily from seed, even if the latter is merely blown about (R. L. Holmes]. It will not bear frost; the stems take root where they touch the ground; an acre has been calculated to yield 30 tons green feed in the rich valleys of the Macleay-River. Quite suitable for bouquets [A. R. Crawford.]

Panicum sanguinale, Linné.*

From Middle and South-Europe, Northern Africa and Southern Asia, spread through all countries with a warm climate, and apparently also indigenous in North- and East-Australia. The "Finger-grass," called "Crab-grass" in the United States, where according to Mr. Hagenauer it is recognised as one of the most useful of all pasture-grasses; in Fiji it is also considered the best grass for pastures according to Mr. Holmes. It accommodates itself to swampy and shady places, readily gets disseminated on barren ground, and it is likely to add to the value of desert-pastures at least in oases, although it is in cold countries annual. P. ciliare (Linné) and P. glabrum (Gaudin) are allied. Colonel Howard of Georgia says of the Crab-grass and Bermuda-grass, that they will live in spite of neglect, but when petted will make such grateful returns as to astonish their benefactor. The Finger-grass spreads readily from seeds as well as joints. Valuable also for binding coast-sand and fixing soil along watercourses; but in warm regions it may become intrusive on agricultural land. Shy to frost. It will spread out to 4 feet width in a year, emitting hundreds of fascicles of florets [W. Read]. Growth after summer-rains very quick. Thrives splendidly on the sandhills of the hot Australian interior also; grows there most vigorously. In the southern states of North-America much valued for midsummer-pasture, though for hay the yield also there proved but light [Sereno Watson].

Panicum semialatum, R. Brown.

Warmer regions of Asia, Africa and Australia. A superior tall pasture-grass, of easy dispersion in warm humid localities.

Panicum spectabile, Nees.*

The "Coapim" of Angola. From West-Africa transferred to many other tropical countries. A rather succulent, very fattening grass, famed not only in its native land, but also long since in Brazil. This grass, which was with the help of the great Kew-establishment first obtained by the author for Australia and Polynesia, is according to Mr. R. L. Holmes "the wonder of all beholders in Fiji, strangling by its running roots almost everything in its course; at its original starting point forming a mass of the richest green foliage, over 6 feet high, gradually lowering to the outer border, where a network of shoots or runners covers the ground; it roots at the joints, and sends up then a mass of the softest and most luscious fodder." In Fiji it runs over the soil at the rate of 10 feet in three months. Readily propagated by pieces of the procumbent stem, which roots freely at each joint. Spoken of also in high praise on account of its astonishing growth by Mr. Edgar, of Rockhampton Botanic Garden, Queensland. Requires to be well fed down. It may be assumed, that at present about 300 well-defined species of Panicum are known, chiefly tropical and sub-tropical; very few extending naturally to Europe or the United States of North-America, Japan or the southern part of Australia. Though mostly from the hot zones, these grasses endure a cooler clime in many instances, and some of them would prove great acquisitions, particularly the perennial species. Numerous good kinds occur spontaneously in Queensland and North-Australia. Panicum is the genus richest in species among grasses.

Panicum striatum, Lamarck. *(P. gibbum,* Elliott.)

Southern States of North-America, West-Indies and Guiana. A perennial grass for swampy localities, valuable for pastoral purposes, according to C. Mohr, who mentions also P. anceps (L.) and P. hians (Elliott) as good fodder-grasses.

Panicum tenuiflorum, R. Brown. (*Paspalum brevifolium,* Fluegge.)

South-Asia and East-Australia. It has a running stem and forms a good bottom as a pasture-grass [Bailey].

Panicum Texanum, Buckley.

Texas. The "Colorado Bottom-grass," also called "Green River-grass." One of the best of forage-grasses for horses, cattle and sheep; yields a sure crop, and produces 2 to 3 tons per acre [Vasey]. The hay from this grass is of a superior kind; it can be cut twice in the season [Carrington]. This grass is however annual, but very leafy and becomes decumbent and widely spreading: growth rapid, many stalks proceeding from the same root. Mr. P. Lea of Texas considers it is the best native grass for hay there, and notes that all kinds of pasture-animals like it preferentially, that the hay from this proved also exceedingly nutritious, and that

it subdues weeds readily. Mr. Ravenel of Carolina found it there to come up spontaneously, much better and larger than most other grasses. Height to 6 feet.

Panicum turgidum, Forskael.

Egypt, where this millet yields a bread-grain.

Panicum virgatum, Linné.

North-America. A tall perennial species, with a wide, nutritious panicle. Easily disseminated. Content with sandy soil, but likes some humidity. The foliage good for fodder when young. Frequent on the prairies, but it will grow even also on sandy sea-coasts. It passes in some places as Switch-grass.

Panicum viride, Linné. (*Setaria viridis,* Beauvois.)

Widely spread over many parts of the old world. Though annual, this grass is of value for the first vegation on bare sand-land, over which, as well as over calcareous soil, it spreads with remarkable facility. The same may be said of Panicum glaucum and a few other related species.

Papaver somniferum, Linné.*

The Opium-Poppy. Countries on the Mediterranean Sea. The capsules of this tall annual, so showy for its flowers, are used for medicinal purposes. From the minute, but exceedingly numerous seeds, oil of a harmless and most palatable kind can be pressed remuneratively: but the still more important use of this plant is for the preparation of opium. Both the black- and pale-seeded varieties can be used for the production of this drug. The return of poppy-culture, whether for opium or for oil, is obtained within a few months. In Hesse Cassel it has recently been proved, that the Poppy-stubbles can well be utilized for sheep-fodder. Mild and somewhat humid open forest-tracts proved most productive for obtaining opium from this plant; but it can also be reared in colder localities, good opium rich in morphia having even been obtained in Middle Europe and the Northern United States, the summers there being sufficiently long to ripen the poppy with a well-elaborated sap. Indeed the plant matures its seeds as far north as lat 69° 18′ in Norway [Schuebeler]. Within the tropics it can also be raised, but best during the cool season. The morphia-contents in opium from Gippsland were on an average somewhat over 10 per cent. Opium was prepared in the Melbourne Botanic Gardens for the Exhibition of 1866; but Mr. J. Bosisto and Mr. J. Hood have given first commercial dimensions to this branch of rural industry in Australia. The Smyrna-variety is particularly desirable for opium; it enables the cultivator to get from 40 lbs. to 75 lbs. of opium from an acre, generally worth 30s. to 35s. per pound. T ground for poppy-culture must be naturally rich or otherwise be v manured; dressing with ashes increases the fecundity of the pl

The seeds, about 9 lbs. to the acre, are generally sown broadcast mixed with sand. In the most favorable places as many as three crops are obtained during a season. The collecting of the opium, which consists merely of the indurating sap of the seed-vessels, is commenced a few days after the lapse of the petals. Superficial incisions, horizontal or diagonal, are made into the capsules as they successively advance to maturity. This operation is best performed in the afternoon and evening, and requires no laborious toil. The milky opium-sap, thus directed outwards, is scraped off next morning into a shallow cup, and allowed to dry in a place away from sunlight; it may also be placed on poppy leaves. From one to six successive incisions are made to exhaust the sap, according to season, particular locality or the knife-like instrument employed. In the Department of Somme (France) alone opium to the value of £70,000 annually is produced and poppy-seed to the value of £170,000. Australian seasons as a rule are favorable for collecting opium, and therefore this culture is rendered less precarious here than in many other countries. Our opium proved often as good as the best Smyrna-kind. The petals are dried for packing the opium. The main-value of opium depends on its contents of morphia, for which the genus Papaver, as far as heretofore known, remains the sole source; but not less than fourteen alkaloids have been detected in opium by the progressive strides of organic chemistry: codein, metamorphin, morphia or morphin, narcein, narcotin, opianin, papaverin, porphyroxin, xanthopin, meconidin, codamin, laudanin, pseudo-morphin and thebain. It contains besides an indifferent bitter principle, meconin and meconic acid (*vide* "Wittstein's Chemische Analyse von Pflanzentheilen," or my English edit. p. 163). Various species of Papaver produce more or less opium and morphia. Great Britain in 1889 imported 492,000 lbs. of opium, valued at £298,000. P. setigerum (De Candolle), supposed to be the wild state of P. somniferum, was cultivated, evidently for the sake of the seeds, by the lacustrine people of Switzerland prior to historic ages [Heer].

Pappea Capensis, Ecklon and Zeyher.

South-Africa. The fruit of this tree is of the size of a cherry, savory and edible. The seeds furnish an oil similar to castor-oil in its effects [Prof. McOwan].

Pappophorum commune, F. v. Mueller.

Widely dispersed over the continent of Australia, occurring also in some parts of Asia and Africa. Perennial; regarded as a very fattening pasture-grass, and available for arid localities and almost rainless zones.

Parinarium Nonda, F. v. Mueller.

The "Nonda-tree" of North-Eastern Australia. Attains a height of 60 feet; its wood soft, close-grained, easily worked [W. Hill].

May prove hardy in mild temperate climes, and may perhaps live in the dry and hot air of deserts, where it deserves trial-culture for the sake of its edible, mealy, plum-shaped fruit. A few other species with esculent drupes occur in different tropical countries.

Parkinsonia aculeata, Linné.

From California to Uruguay. A thorny shrub, clearly adapted for the warmer regions of the temperate zone, where it might be utilized with the following plant for evergreen hedges. Became naturalized in the milder tracts of Eastern Australia. The flowers are handsome. Six other species occur in various parts of America.

Parkinsonia Africana, Sonder.

South-Africa. A tall hedge-bush.

Parrotia Jacquemontiana, Decaisne.

North-Western Himalayas, from about 3,000 to 8,500 feet elevation. This deciduous-leaved small tree merits attention. Its tough and pliable twigs are used for basket-work and preferred for twig-bridges, the latter sometimes 300 feet long; hence this tree could be used for a variety of economic purposes [Stewart and Brandis]. P. Persica (C. A. Meyer) occurs on the Caspian Sea.

Parthenium integrifolium, Linné.

Eastern North-America. The flowering tops of this perennial bitter herb have come into use as a febrifuge [Houlton].

Paspalum ciliatum, Humboldt.

Tropical South-America. A perennial and lauded cereal grass.

Paspalum dilatatum, Poiret. (*P. ovatum,* Trinius.)

North- and South-America into extra-tropic latitudes. Perennial; of excellent quality for fodder; keeps green during the hottest summer-time. Mr. Bacchus found it hardy up to a height of 2,000 feet in Victoria. It grew 4½ feet in little more than two months in New South Wales, after drought was followed by heavy rains. It is closely allied to the Mexican P. virgatum, L. Introduced into Australia by the writer with many other fodder-grasses Reported to have extra-ordinary drought-resistance [W. Farrer].

Paspalum distichum, Linné.*

The "Silt-Grass." North- and South-America, except the colder regions; elsewhere probably introduced, though now widely naturalised also in the warmer coast-tracts of the eastern hemisphere. Possibly indigenous to Australia also. Endures some frost. Will submit to temporary inundation; will grow half emerging in shallow pools or wet meadows, and proves quickly fattening t cattle [A. R. Crawford]. A creeping bank- or swamp-gra

forming extensive cushions. It keeps beautifully green throughout the year, affords a sufficiently tender blade for feed, and is exquisitely adapted to cover silt or bare slopes on banks of ponds or rivers, where it grows grandly; moderate submersion does not destroy it, but frost injuries it; it thrives well also on salt-marshes. The chemical analysis made in spring gave the following results:— Albumen 2·20, gluten 7·71, starch 1·56, gum 1·64, sugar 5·00 (F. v. Mueller and L. Rummel).

Paspalum læve, Michaux.

Southern States of North-America. Perennial. Prof. Phares states, that for successive years two tons of hay of this meadow-grass can be mown from an acre, it almost never seeding when regularly cut.

Paspalum lentiginosum, Presl.

Southern States of North-America and Mexico. Spreads by runners and forms a close turf [Dr. Vasey]. P. Floridanum (Michaux) of the same region is a tall species of vigorous growth. P. purpurascens (Elliot) is leafy and succulent, and roots at the lower joints.

Paspalum notatum, Fluegge.*

From Virginia to Argentina. This is one of the best of fodder-grasses there, forming a dense, soft, carpet-like sward on meadows, and becoming particularly luxuriant and nutritious on somewhat saline soil [Lorentz]. Closely cognate to P. distichum. P. ovatum (Torrey) is probably a variety of P. notatum. It is known as Alabama-grass. Hardy, perennial, relished by stock. Highly spoken of in the Southern States of North America on account of its drought-resisting property [Hon. J. L. Dow]. Dr. Vasey recommends it as one of the very best pasture-grasses of Alabama, Louisiana and Texas.

Paspalum platycaule, Poiret. (*P. compressum,* Presl.)

Warmer regions of North- and South-America, extending northward to Alabama. A nutritive pasture-grass, particularly eligible for sandy coast-lands [C. Mohr]. The creeping stems become closely matted [Dr. Vasey].

Paspalum scrobiculatum, Linné.

Through the tropics of the eastern hemisphere widely dispersed, extending to South-Eastern Australia, New Zealand and Polynesia also. A valuable pasture-grass, which will grow on poor land, also on swampy ground. A superior variety is cultivated in India for a grain-crop. This grass furnishes a good ingredient for hay. Its stem sometimes attains a height of 8 feet. Rosenthal pronounces it pernicious, perhaps when long and exclusive use is made of this grass, or possibly when diseased through fungus-growth. In hot climes it can become a troublesome intruder on plantations.

Paspalum stoloniferum, Bosc. (*P. purpureum,* Ruiz et Pavon).

Central America. A fodder-grass of considerable value. Noticed by Mr. T. Ball in the Andes up to 9,000 feet. Specially mentioned as a good pasture-grass in Peru, by Professor Dr. J. A de los Rios.

Paspalum undulatum, Poiret.

North- and South-America. Noticed by C. Mohr as valuable for fodder. A Gray records it as annual.

Passiflora alata, Aiton.

Peru and Brazil. This Passion-flower and all the following (probably with some other species) furnish Granadilla-fruits. All the species here recorded are perennial, some woody and widely climbing.

Passiflora coccinea, Aublet.

From Guiana to the La Plata-States. The fruits are eaten raw or boiled [Hieronymus]. This plant with probably many others of the genus contains a chemical principle of hypnotic value.

Passiflora cœrulea, Linné.

South-Brazil and Uruguay. One of the hardiest of all Passion-flowers, and with many others well adapted for covering bowers, rockeries and similar structures. Matures its fruit in the open air even at London [Masters]. The Brazilian P. actinia (Hooker) is hardy in Provence [Naudin]. Many of the equatorial species come from mountainous regions, and may thus endure mild temperate climates.

Passiflora edulis, Sims.

Southern Brazil. Frost-shy. With P. quadrangularis preferentially grown in subtropic Eastern Australia. Fruit purple.

Passiflora filamentosa, Willdenow.

Southern Brazil.

Passiflora incarnata, Linné.

North-America, from Virginia and Kentucky southward. The fruits are called May-pops.

Passiflora laurifolia, Linné. (*P. tinifolia,* Jussieu.)

The Water-Lemon. From the West-Indies to Brazil.

Passiflora lingularis, Jussieu.

From Mexico to Bolivia. Professor Ernst of Caraccas says, th *its* fruit is one of the finest anywhere in existence.

Passiflora lutea, Linné.

North-America, from Pennsylvania and Illinois southward. With P. cœrulea and P. incarnata among the hardiest of the genus. Berries small.

Passiflora macrocarpa, Masters.

Brazil and Peru. Mr. Walter Hill reported, to have obtained fruits of 8 lbs. weight at the Brisbane Botanic Garden. This species is not a prolific bearer [Edgar].

Passiflora maliformis, Linné.

From the West-Indies to Brazil.

Passiflora mucronata, Lamarck.

Brazil, extending far south. Fruit edible [Dr. Rosenthal].

Passiflora, pedata, Linné.

From the West-Indies to Guiana. This is among the species, mentioned by Dr. Rosenthal as yielding edible fruits.

Passiflora quadrangularis, Linné.

Brazil. One of the most commonly cultivated Granadillas. The fruits attain a large size, and are of the finest taste. Cultivated in Jamaica up to 3000 feet [W. Fawcett].

Passiflora serrata, Linné.

From the West-Indies to Brazil.

Passiflora suberosa, Linné. (*P. pallida,* Linné.)

From Florida to Brazil. A careful investigator, Dr. Maxw. Masters, has recently defined about 200 species of Passion-flowers.

Passiflora tiliifolia, Cavanilles.

Peru. Fruit edible, according to Dr. Rosenthal.

Paulinia sorbilis, Martius.

Brazil. A climbing shrub, possibly hardy in the warm temperate zones, where many tropical Cupaniæ and other sapindaceous trees endure the clime. The hard Guarana-paste of chocolate-colour is prepared from the seeds by trituration in a heated mortar with admixture of a little water, kneading into a dough and then drying. This paste, very rich in coffein, serves for a pleasant beverage, and is also used medicinally.

Paulownia imperialis, Siebold.

Japan. A tree, hardier than Cercis Siliquastrum, of value for scenic effects. It will endure the climate of Norway to lat. 51° 58′ [Professor Schuebeler]. Rises in 10 years to 30-40 feet.

Peireskia aculeata, Miller.

The Barbadoes-Gooseberry. West-Indies. A tall shrub, adapted for hedges in localities free of frost. The cochineal-insect can be reared on this plant also. The berries are edible; the leaves available for salad. The flowers frequented by bees. Several other species exist in tropical America, among which P. Bleo, Humb., is particularly handsome; but they may not all be sufficiently hardy for utilitarian purposes in an extra-tropical clime.

Peireskia portulacifolia, Haworth.

West-Indies. This attains the size of a fair tree.

Pelargonium odoratissimum, Aiton*

South-Africa. A perennial trailing herb, from the leaves of which a fragrant oil can be distilled. Pelargonium-oil is extensively produced in Algeria as a cheap substitute for attar of roses. There the rate of annual production of the "essence of geranium" is about 12,000 lbs. One ton weight of fresh leaves will yield about 2 lbs. volatile oil [Piesse]. The same remark applies to the shrubby P. radula and P. capitatum. The Kaffirs assert, that these plants keep off snakes. Easily multiplied from cuttings. On this occasion may be pleaded also for the hundreds of distinct kinds of Pelargonium, many seemingly doomed to utter annihilation in South-Africa, unless indeed some statesman there by legislation will see these lovely plants protected at least on a few pristine spots within permanently reserved small areas, for the joy also of future generations; so also the hundreds of charming species of Erica, only there to be found, claim immunity for ever against herds and flocks; and thus likewise might, under enlightened foresight, yet timely be saved and sheltered the numerous and gay Polygaleæ, podalyrious Leguminosæ, Phylicæ, Crassulæ, Mesembrianthema, Proteaceæ, Gnidia and the incomparable Irideæ and Liliaceæ of the South-African Flora, so far, at least, as not to be swept away altogether from the face of the globe.

Pelargonium peltatum, Aiton.

South-Africa. A climber, grateful to culture in mild climes well adapted for bowers, for large garden-edgings, and for covering fences and minor unsightly buildings, also bare branches shrubs and small trees.

Peltophorum Linnæi, Bentham. (*Cæsalpinia Brasiliensis,* Linné.)

A small tree, which provides the orange-colored Brasiletto-wood. This species likes dry calcareous soil [Grisebach]. Endures the climate of Carolina.

Pennisetum cenchroides, Cl. Richard.

Africa and South-Western Asia. Perennial. The Unjum or Dhaman or Anjam. At Allahabad this is regarded as a first-rate fodder-grass. [Dr. Stewart]. Well adapted for silos [General Sir H. Macpherson]. In its own countries one of the best of grasses for green fodder and hay; so nutritious as to have led to the native saying: "What Ghi (or Ghee, *i.e.*, clarified butter) is to man, that the Dhaman is to a horse" [Prof. Robert Wallace].

Pennisetum Arnhemicum, F. v. Mueller.

North-Australia and Queensland. This grass remains strong and green through the hottest months, forming compact tussocks. All kinds of pasture-animals are very fond of it [Molineux].

Pennisetum latifolium, Sprengel.

Extra-tropical South-America. A tall perennial nutritious grass, forming large tufts, easily spreading from the roots or seeds. It is of quick growth.

Pennisetum typhoideum, Richard.* (*Penicillaria spicata,* Willdenow; *Panicum cæruleum,* Miller.)

The Bajree or Pearl-Millet. Tropical Asia, Nubia and Egypt. An annual, requiring only about three months to ripen its millet-crop in warm countries. The stems are thick and reach a height of 6–10 feet, several being produced from one root, and each again forming lateral branches; the maximum-length of a spike is about a foot and a half; Colonel Sykes saw exceptionally 15 spikes on one plant and occasionally 2,000 seeds in one spike. Together with sorghum this is the principal cereal, except rice, grown in India by the native races. This grass requires a rich and loose soil, and on such it will yield upwards of a hundred-fold. It furnishes hay of good quality, though not very easily dried, and is also valuable as green fodder. In the United States cultivated as far north as Pennsylvania, and it matures seeds even as far north as Christiania in Norway [Schuebeler]. Thrives fairly well at Port Phillip. Its fast growth prevents weeds from obtaining a footing. In very exceptional cases and under most favorable circumstances as regards soil and manure, the first cutting is in six or seven weeks, the stems up to seven feet high, giving at the rate of 30 tons green feed, or 6½ tons of hay per acre; in six or seven weeks more a second cutting is obtained, reaching 55 tons per acre of green feed, the grass being nine feet high; a third cut is got in the same season. Farm-stock eat it greedily. One plant of pearl-millet "is worth

three of maize for fodder." Some of the many other species of Pennisetum are doubtless of rural value. A plant allied to P. typhoideum occurs in China, namely P. cereale (Trinius). This also affords millet or corn for cakes.

Pennisetum villosum, R. Brown.

Abyssinia. A grass of decorative beauty, forming ample tufts; it is recommended by Dr. Curl for permanent pasture in New Zealand. With numerous other grasses it was introduced into Australia by the writer of this work. Proves fruitful in Norway to lat. 67° 56′ [Schuebeler].

Pentzia virgata, Lessing.

South-Africa. A small cushion-like bush, recommended for establishment in deserts for sheep-fodder. It has the peculiarity, that whenever a branch touches the ground, it strikes roots and forms a new plant; this enables the species to cover ground rapidly [Sir Samuel Wilson]. Valuable also for fixing drift-sand in water-rills, by readily bending over and rooting, thus forming natural little catch-dams to retain water [McOwan]. Mutton from sheep depasturing on this plant proves particularly palatable. Several other species occur in South-Africa. Systematically these plants are allied to the Tansy.

Periandra dulcis, Martius.

Sub-tropical Brazil. The sweet root of this shrub yields a kind of liquorice.

Perilla arguta, Bentham.

Japan. An annual herb. An infusion of this plant is used for imparting a deep-red colour to table-vegetables and other substances. In Japan the seeds are pressed for oil. P. ocimoides, L., of Upper India, probably serves similar purposes. Some species of Perilla are suitable for ribbon-culture P. Nankinensis affords its aromatic flowers as a condiment in China and Japan.

Persea gratissima, Gaertner.

The Avocado-Pear or rather "Aguacate," called in Peru "Palta." From Mexico to Peru and Brazil in forest-tracts near the coast; but its real nativity, according to A. de Candolle, restricted to Mexico. A noble evergreen spreading tree. Adverse to drought; likes humid soil. Suggestively mentioned here as probably available for mild localities outside the tropics, inasmuch as it has become naturalised in Madeira, the Azores and Canary Islands. The fruit attains sometimes a weight of 2 lbs., and is generally sliced for salad, and of delicious taste and flavour. Its nut contains about 8 per cent. of greenish oil. In Jamaica it is cultivated up to 4,000 feet [W. Fawcett]. It matured in li

Eastern Australia, somewhat outside the tropics [Edgar]. Lives unprotected as far south as Port Jackson [C. Moore]. The seeds have come into medicinal use at the instance of Dr. Froehling, particularly through the efforts of Messrs. Parke and Davis, to whom we mainly owe the recent introduction of many other valuable new drugs into medicine.

Persea Teneriffæ, F. v. Mueller. (*P. Indica,* Sprengel.)

Madeira, Azores and Canary Islands. This magnificent tree produces a beautiful, hard, mahogany-like wood, especially sought for superior furniture and turners' work. One of the most hardy trees of the large order of Laurinæ.

Peucedanum graveolens, Bentham. (*Anethum graveolens,* Linné.)

The "Dill." South-Europe, North-Africa, Orient. Annual. The well-known aromatic fruitlets used as a condiment. In India known as Sowa. Distilled dill-oil is in use also for scented soaps.

Peucedanum officinale, Linné.

The Sulphur-Root. Middle and Southern Europe, Northern Africa, Middle Asia. Perennial. The root is used in veterinary medicine; it contains, like that of the following species, the crystalline peucedanin.

Peucedanum Ostruthium, Koch. (*Imperatoria Ostruthium,* Linné.)

Mountains of Middle Europe. A perennial herb, which could be grown in alpine regions. The acrid aromatic root is used in medicine, particularly in veterinary practice; required also for the preparation of some kinds of Swiss Cheese. P. Cervaria (Cusson) and P. Oreoselinum (Moench) are also occasionally drawn into medicinal use.

Peucedanum sativum, Bentham.* (*Pastinaca sativa,* Linné.)

The "Parsnip." Europe, Northern and Middle Asia. Biennial. The root palatable and nutritious. The wild root is somewhat acrid, and poisonous effects have occasionally resulted from its use. A variety is cultivated in the Channel-Islands, with roots 3 or 4 feet long [Chambers]. A somewhat calcareous soil is favorable to the best development of this plant. It is very hardy, having been grown in Norway to lat. 70° 22′; it matured seeds as far north as lat. 67° 56′ [Schuebeler]. Ripens its seeds well, even in the hot and dry Central-Australian regions [H. Kempe], where the Parsnip yields crops throughout the year. The culture is that of the carrot; for fodder the root surpasses that of the latter in augmenting milk [Langethal]. A decoction of parsnip-roots ferments with sugar and yeast into a sparkling beverage, but requires casking for about a year [Baudinet].

Peucedanum Sekakul, F. v. Mueller. (*Pastinaca Sekakul,* Russell; *Malabaila Sekakul,* Boissier.)

From Greece to Persia and Egypt. The root of this perennial herb was brought already under medical notice by Dr. Rauwolf; in a boiled state it affords a palatable esculent.

Peumus Boldus, Molina.

The Boldo of Chili. A small ornamental evergreen tree, with exceedingly hard wood, which is utilised for many kinds of implements. The bark furnishes dye-material. The fruits are of aromatic and sweet taste [Dr. Philippi].

Peziza macropus, Persoon.

Europe. Mentioned by Prof. Goeppert among the edible mushrooms, sold in Silesia along with P. repanda (Wahlenberg).

Phalaris aquatica, Linné.

Southern Europe and Northern Africa. Important as a perennial fodder-grass, fit for wet ground.

Phalaris arundinacea, Linné.

Temperate and colder regions of Europe, Asia and America; indigenous in Norway to lat. 70° 30′. Not without some importance as a reedy grass of bulky yield on wet meadows or in swampy places. A variety with white-striped leaves is a favorite as a ribbon-plant for garden-plots.

Phalaris Canariensis, Linné.

The Canary-grass. An annual grass from the Canary-Islands, now widely dispersed as a spontaneous plant over the warmer zones of the globe. Thus it has also become naturalised in Australia. It will endure the climate of Norway to lat. 70° 22′, bearing seed to lat. 63° 26′ [Prof. Schuebeler]. It is grown for its seeds, which form one of the best kinds of food for many sorts of small cage-birds. The flour is utilised in certain processes of cotton-manufacture, and liked even for some kinds of cakes. The soil for culture of the Canary-grass must be friable and not too poor. It is an exhaustive crop. Chemical constituents here (in November): Albumen 1·59, gluten 6·14, starch 1·03, gum 6·64, sugar 2·86 per cent. (F. v. Mueller and L. Rummel); another analysis in the same month gave: Albumen 1·06, gluten 5·64, starch 0·98, gum 3·22, sugar 4·20 per cent. Import of seeds during 1887 into Victoria, 2,981 centals, valued at £1,738. As allied species of similar use, but mostly of less yield, may be enumerated: P. brachystachys (Link) from Italy, P. minor (Retzius) and P. truncata (Gussone) from various countries on the Mediterranean Sea, the last-mentioned being perennial. Other species, including some from Asia, deserving of trial. P. minor is recommended by Dr. Curl f

manent pastures, as it supplies a large quantity of fine, sweet, fattening foliage, relished by stock. It keeps green far into the winter in the climate of New Zealand.

Pharnaceum acidum, J. Hooker.

St. Helena. A dwarf perennial succulent plant, which might advantageously be naturalised on sea-shores, to yield an acid salad, perhaps superior to that of Portulaca oleracea.

Phaseolus aconitifolius, Jacquin.

India, up to 4,000 feet. A dwarf annual species. Dr. Forbes Watson admits it among the culinary beans of India. It will bear on arid soil. P. trilobus (Aiton), the Simbi-bean, is a still hardier variety, which becomes perennial.

Phaseolus adenanthus, G. Meyer. (*P. Truxillensis,* Humboldt; *P. rostratus,* Wallich.)

Almost cosmopolitan within the tropics, where, irrespective of navigation and other traffic, it becomes dispersed by migrating birds; truly spontaneous also in tropical Australia. A perennial herb with large flowers, resembling those of Vigna vexillata (Bentham). Cultivated for its seeds, which are rather small, but copiously produced. A variety with edible roots occurs.

Phaseolus coccineus, Kniphof.* (*P. multiflorus,* Willdenow.)

The Scarlet Runner. Tropical South-America. A twining showy perennial, as useful as the ordinary French bean. Its seeds usually larger than those of that plant, purple with black dots, but sometimes also pure-blue and again quite white. The flowers occur sometimes white. The root contains a narcotic poison.

Phaseolus derasus, Schranck.*

Brazil. There, next to maize, the most important and extensively used plant for human food [Dr. Peckolt]. Sprengel refers this to P. inamænus (Linné), a variety of the following species.

Phaseolus lunatus, Linné.*

The "Lima-bean." Perennial. Tropical South-America. A. de Candolle restricts the real nativity to that part of the globe. Wittmack identifies beans from ancient graves in Peru as belonging to this species. The root is deleterious. Biennial according to Roxburgh. Much cultivated in the warm zone for its edible beans, which are purple or white. P. inamænus (Linné) is hardly specifically distinct, but grows taller and produces larger fruits; it is known as a Lima-bean, but also as the Madagascar-bean, and has proved hardy and productive in Victoria. P. perennis (Walter) from the United States of North-America is another allied plant; also P. Pallar (Molina) of Peru, the latter perennial, with a comparatively thick stem. [Wittmack].

Phaseolus Max, Linné.* (*P. Mungo*, Linné.; *P. radiatus*, Linné.)

The "Green Gram." South-Asia and tropical Australia. An annual, very hairy plant, not much climbing. Frequently reared in India, when rice fails or where that crop cannot be produced. According to Sir Walter Elliot one of the most esteemed of Indian pulses. "It fetches the highest price, and is more than any other in request among the richer classes, entering largely into delicate dishes and cake." Cultivated up to 6,000 feet [Forbes Watson]. Col. Sykes counted sixty-two pods on one plant with from seven to fourteen seeds in each. The seeds are but small, and the herb is not available for fodder. This plant requires no irrigation, and ripens in two and a half to three months. In India it yields the earliest pulse-crop in the season. Paillieux records, that the young sprouts serve as a delicate vegetable.

Phaseolus vulgaris, l'Obel.*

The ordinary Kidney-bean or French bean or Haricot. Native country Western South-America, inasmuch as Professor Wittmack has recently identified beans from ancient graves at Lima as belonging to P. vulgaris, and records them also from places of interment in Arizona, together with Maize, Prosopis and Phascolus Pallar (Molino). Found also already in culture at the St. Lorenz River, when that stream was discovered by Cartier, together with Pumpkins or Gourds. Beans were much cultivated in the Antilles, Florida and Mexico, prior to the arrival of Europeans, according to Acosta, Oviedo and Vaca. Professor Wittmack refers the black beans, widely known as "Feijdospretos" through South-America and there extensively used for human food, to P. vulgaris as a variety. Though this common and important culinary annual is so well known, it has been deemed desirable to refer to it here, with a view of reminding our readers, that the kidney-bean is nearly twice as nutritious as wheat; it is, among culinary vegetables, the richest in nitrogenous compounds. The meal from beans might also find far-augmented use. As constituents of the beans should be mentioned a large proportion of starch (nearly half), then much legumin, also some phaseolin (which, like amygdalin, can be converted into an essential oil) and inosit-sugar. The tall variety also well suited for moist equatorial regions. A variety called Cardinal's Bean (P. sphaericus) has globular red seeds. Lentils contain more legumin but less starch, while peas and beans are almost alike in respect to the proportion of these two nourishing substances. The kidney-bean can still be cultivated in cold latitudes and at sub-alpine elevations, if the uninterrupted summer-warmth last for four months; otherwise it is more tender than the pea. The soil should be friable, somewhat limy and sandy for field-culture. Phaseolus nanus, L. (the dwarf bean) P. tumidus, Savi (the sugar-bean, sword-bean or egg-bean) varities of P. vulgaris. Several other species of Phaseolus worthy of culinary culture. Haricot-Beans contain very

deobstruent properties, which however are generally destroyed by too much boiling. To obviate this, they should be soaked for 24 hours in cold water, to which salt has been added, and then gently boiled for not more than 30 or 40 minutes in very little water [W. B. Booth]. The seeds will retain their vitality fully three years. This plant matures under horticultural care even in the dry hot desert-regions of Central Australia.

Phleum alpinum, Linné.

Europe, Asia, North- and South-America, on high mountains, extending to Arctic regions. According to Drs. Stebler and Schroeter, this is a good productive fodder-grass on strong but not too wet soil.

Phleum Michelii, Allioni.

Mountains of Middle and Southern Europe. A tall, productive, valuable fodder-grass, naturally confined to limestone-formation, generally on dry, stony soil in sunny situation [Drs. Stebler and Schroeter]. Better suited for mowing than graziug.

Phleum pratense, Linné.*

The Timothy- or Catstail-grass. Europe, North-Africa, Northern and Middle Asia; ascends to 10,000 feet in Spain. One of the most valuable and most cultivated of all perennial fodder-grasses. Its production of early spring-foliage is superior to that of the Cocksfoot-grass. It should enter largely into any mixture of grasses for permanent pasturage. It will live also on moist and cold clay-ground. This grass, and perhaps yet more the allied Phleum alpinum, L., are deserving of an extensive transfer to moory drained regions. It is very hardy, having been found indigenous in Norway to lat. 70° [Professor Schuebeler]. For hay it requires mowing in a young stage. The seed is copiously yielded and well retained. The greatest advantage from this grass arises, according to Langethal, when it is grown along with clovers. It thrives even better on sandy meadows than on calcareous soil; it will prosper on poorer ground than Alopecurus pratensis; the latter furnishes its full yield only in the fourth year, whereas the Phleum does so in the second. The Timothy-grass dries more quickly for hay and the seeds are gathered more easily, but it vegetates later, is of harder consistence, and yields less in the season after the first cut. Dr. Curl, of New Zealand, observes, that while many grasses and clovers, if eaten in their spring-growth, may cause diarrhœa in sheep, the Timothy-grass, when young, does not affect them injuriously. Well adapted for irrigation-ground; the yield of hay varies from 40 to 120 cwts. on an acre. Occasionally attacked by fungus-disease, particularly from Epichloe typhina, when sheep should be put on the affected fields [Stebler].

Phœnix Canariensis, Naudin. (*P. Jubae,* Webb.)

Canary-Islands. A superb palm for scenic culture, hardier than even the Date-palm. Fruit not edible.

Phœnix dactylifera, Linné.*

The Date-Palm. North-Africa, particularly inland; Arabia, Persia. This noble palm attains finally a height of about 80, feet, exceptionally 120 feet. "Trees of from 100 to 200 years old continue to produce their annual crop of dates," though gradually at very advanced age in lesser quantity. Should be raised in the oases of the Australian desert million-fold. Bears fruits in subtropic Eastern-Australia in particular abundance. Though sugar or palm-wine can be obtained from the sap, and hats, mats and similar articles can be manufactured from the leaves, we would utilise this palm beyond scenic garden-ornamentation only for its fruits. The date-palm would afford in time to come a real boon in the oases of desert-tracts, swept by burning winds, although it might be grown also in the valleys of mountains and in any part of lowlands free of severe frost. Several bunches of flowers are formed in a season, each producing often as many as 200 dates. Staminate and pistillate flowers rarely on the same plant. In Egypt as many as 4 cwt. of dates have been harvested in one season from a single date-palm. Many varieties of dates exist, differing in shape, size and colour of the fruit; those of Gomera are large and contain no seed. The best Algerian variety is known as "Deglet nour." Select trees are recorded as having borne a crop worth £2, but the average may be put down at four shillings per tree annually, common kinds less than one shilling. A good date-tree is sometimes exchanged for a camel in North-Africa. 80 trees to an acre is considered the most suitable number. The neighbourhood of the sea is unfavorable to the production of good dates [M. G. Rolland, Hon. G. W. Cotton]. The unexpanded flower-bunches can be used for palm-cabbage and the fibre of the leaf-stalks for cordage. The town Elche, in Spain, is surrounded by a planted forest of about 80,000 date-palms, and the sale of leaves for decorative purposes produces a considerable income to the town, irrespective of the value of the date-fruits; and so it is at Alicante. As far north as the Gulf of Genoa also a date-forest exists. The ease, with which this palm grows from seeds, affords facilities in adapted climes to imitate these examples, and we certainly ought to follow them in all parts of Australia and in similar climes. Young plants might readily be taken by tourists to forest-glens for naturalisation. The date-palm bears well in Southern California and Arizona [Prof. Hilgard]. Dates, as a nourishing, wholesome and readily preserved kind of fruit, should be in the commissariat of exploring expeditions, particularly through mild or hot countries, as the seeds could be sown, for thus early raising this important palm in new regions. Dr. Bonavia is the principal champion for extensive date-culture in India. See

also the author's remarks in the Transact. Vict. Inst. ii, 95 (1857). The best dates are grown in oases, where fresh water gushes from the ground in abundance and spreads over light soil of deserts subject to burning winds. The Zadie-variety produces the heaviest crop, averaging 300 lbs. to the tree; superior varieties can only be continued from offshoots of the root; these will commence to bear in five years and be in full bearing in ten years; one male tree is considered sufficient for half a hundred females. The pollen-dust is sparingly applied by artificial means. The pulpy part of the fruit contains about 58 per cent. of saccharine matter. It is estimated, that in Egypt alone four millions of date-palms exist, the produce of which is to a large extent consumed locally. The date-groves of Turkey produce annually 40,000 to 60,000 tons of dates in ordinarily good seasons [Le Duc]. The date-palm will luxuriate even in saltish soil, and the water for its irrigation may be slightly brackish [Surgeon-Major Colvill]. The artesian water of the Oued Rir district in Algeria contains from 0·57 ounces to 1·07 ounces dry salt in a gallon [Rolland]. The importation of dates during 1885 into Britain was 5,000 tons. Northern limit of the date 35° north latitude. Into Central Australia the date-palm was first introduced by the writer of this work, where it commenced to bear fruit at the age of 8 years, and passed unhurt through years of tremendous drought and with the scantiest supply of bad water [Rev. H. Kempe]. It grows amazingly near the Gulf of Carpentaria [Joseph O'Reilley]. The culture extends in Asia northward to Beluchistan. The variety "Datheres-sifia" ripens its fruits early in the season [Naudin]. It is propagated from suckers. Its pungent rigidity protects this palm from encroachment of pasture-animals; hence it can be left without hedging.

Phœnix Hanceana, Drude.

South-China. This palm was buried for ten days under three feet of snow in the south of France without injury [Naudin].

Phœnix paludosa, Roxburgh.

India. A stout species, not very tall. Of value at least for decorative culture.

Phœnix pusilla, Gaertner.

India and South-China. A dwarf species, which bears the clime of the South of France without protection [Kerchove de Denterghem]. P. farinifera (Roxburgh) appears to be identical. It is adapted for sandy and otherwise dry and barren land, but prefers the vicinity of the sea. Berry shining-black, with a sweet mealy pulp.

Phœnix reclinata, Jacquin.

South-Africa, in the eastern districts. A hardy species, but not tall, often reclining. It is adapted for ornamentation. In warm climes the seeds will grow, just where they dropped. The sweet coating of the fruit is edible [Backhouse].

Phœnix silvestris, Roxburgh.

India, almost on any soil or in any situation, down even to the edge of drift-sand on the coast. It has proved a very hardy species at Melbourne. Its greatest height is about 40 feet. Berries yellowish or reddish, larger than in P. pusilla. Where this palm abounds, much sugar is obtained from it by evaporation of the sap, which flows from incisions into the upper part of the trunk—a process not sacrificing the plant, as for 50 years the sap can thus be withdrawn. This palm-sugar consists almost entirely of cane-sugar. A kind of arrack is obtained by fermentation and distillation of this sap, and also from the young spikes. Each plant furnishes the juice for about 8 lbs. of date-sugar annually, but in some instances much more. About 50,000 tons of sugar a year are produced in Bengal alone from this and some other palms. The leaves are used for mats. The tree lives in drier regions than other Indian palms. Mr. Fr. Turner fertilized this species with the pollen of P. dactylifera; the result was a much finer fruit. Dr. Trimen distinguishes the closely allied wild Ceylon-species as P. Zeilanica.

Phœnix spinosa, Thonning.

Tropical Africa, ascending mountain-tracts, thus perhaps hardy in milder extra-tropic regions. Sir John Kirk found, that the green bunches, if immersed in water for half a day, suddenly assume a scarlet hue, when the astringent pulp becomes edible and sweet.

Phormium tenax, J. R. and G. Forster.*

The Flax-Lily of New Zealand, where it grows as far south as 46° 30′, and up to an elevation of 4,000 feet, occurring also in the Chatham-Islands and Norfolk-Island, though not on Lord Howe's Island; it is also found in the Auckland-Islands, nearly 51° south [Schur]. Height to 15 feet [D. Crombie]. It flowered in several places of England in exposed positions, and was not affected by severe frost [Masters]. It perfected seeds even in the most northern of the Orkney-Islands [Traill] and will bear unhurt a temperature of 15° F.; the tops of the leaves become injured at 9° F. [Gorlie]. It is desirable, that this valuable plant should be brought universally under culture, particularly on any inferior spare-ground, along railway-lines or on the sea-beaches or any rocky declivities, where it may be left to itself unprotected, as no grazing animal will touch it; yielding for ever returns; thriving also well in shade. Can be even grown on ground pervaded by the off-flow of soap-factories is evident, that the natural growth will soon be inadequate to

demand for the plant. It is adapted for staying bush-fires, when planted in hedgerows. Merely torn into shreds, the leaves serve at once in gardens and vineyards as cordage, and for this purpose, irrespective of its showy aspect, the Phormium has been distributed from the Botanic Garden of Melbourne during many years by the writer. From the divided roots any plantation can gradually be increased, or this can be done more extensively still by sowing the seeds. In all likelihood the plant would thrive and become naturalized in Kerguelen's Land, the Falkland-Islands, the Faroe- and Shetland-Islands and many continental places of both hemispheres far into cold latitudes. Among varieties three are better characterized than the rest: the Tehore-, the Swamp- and the Hill-variety. The first and the last mentioned produce a fibre fine and soft, yet strong, and the plant attains a height of only about 5 feet, whereas the Swamp-variety grows to double that height, producing a larger yield of a coarser fibre, which is chiefly used for rope- or paper-making. One of the most dwarf varieties is P. Colensoi (J. Hooker), a lax variety is P. Hookeri (Gunn). As might be expected, the richer the soil, the more vigorous the growth of the plant. Flooding now and then with fresh or brackish water is beneficial, but the plant will not live, if this be permanent. In swampy ground trenches should be dug, to divert the surplus of humidity. Fibre free from gum-resin, properly dressed, withstands moisture as well as the best Manilla-rope. Carefully prepared, the fibre can be spun into various textile durable fabrics, either by itself or mixed with cotton, wool or flax. Elegant articles are woven from it by the Maories. In October 1872 the sale of Phormium-fibre in London was 11,500 bales, ranging in price from £19 to £31. In 1888 the value of Phormium-fibre exported from New Zealand amounted to £90,000. The tow can be converted into paper, distinguished for its strength and whiteness. The London price of Phormium-fibre for this purpose is from £10 to £20 per ton. Messrs. Christy, Cross and Bevan employ a freezing process in separating all kinds of fibres from stalks or foliage, and this method proved particularly advantageous in treating Phormium. A strong decoction of the root and leaf-bases used in surgery for dressing wounds with a view of producing ready and healthy granulation [F. A. Monkton]. For further details on the utilisation of this plant, the elaborate report of the New Zealand Commission for Phormium should be consulted, also Sir James Hector's special publication.

Photinia eriobotrya, J. Hooker.* (*P. Japonica,* Franchet and Savatier; *Eriobotrya Japonica,* Lindley.)

The "Loquat." China and Japan. This beautiful evergreen shrub or small tree, remarkable for its refreshing fruit, is easily raised from seed; or superior varieties can, according to G. W. Johnson, be grafted not only on its own stock, but also on the Whitethorn, or better still on the Quince. It is also a grand bush for scenic ornamental effects, and lifts well. Growth of celerity, but

needs to be well sustained by humidity to bear copiously. In Southern Australia flowering during midwinter; the flowers are intensely fragrant, and do not suffer from a few degrees of frost; hence this plant is of particular horticultural importance, to contribute amply to garden-fragrance in winter-time. About Trieste the Loquat is the earliest fruit of the season [Baron von Thuemen], bearing also copiously there. In Greece the fruits ripen already during May. Hemsley mentions this plant among the shrubs and trees, hardy in England, where however it seldom matures its fruits. Seeds must be sown soon after they are ripe. They contain much hydrocyanic acid and are therefore only fit for medicinal use. Most important as a honey-plant, flowering so early [Prof. Savastano]. P. villosa, D.C., also yields edible native fruit to the Japanese. Bore profusely in Wicklow [G. Donaldson].

Phyllanthus Cheremila, Roxburgh. (*Cicca disticha*, Linné.)

Insular India. A small tree. Hardy in Florida 27° 30', where Mr. Reasmer finds it to be a desirable fruit-tree. The berries are small and acid, serving for jam. Mr. L. A. Bernays admits this plant among those recommended in his work on "Cultural industries for Queensland," 1883, having tested it as far south as Moreton-Bay.

Phyllocladus rhomboidalis, Cl. Richard.

Celery-Pine of Tasmania. A stately tree, often to 60 feet high, with a stem 2 to 6 feet in diameter. The timber is particularly valuable for the masts and spars of ships. It will only grow to advantage in deep forest-valleys. Dwarfed in alpine elevations.

Phyllocladus trichomanoides, D. Don.

Celery-Pine of New Zealand; Maori-name, "Tanehaha." This tree attains a height of 70 feet, with a straight stem reaching 3 feet in diameter, and furnishes a pale close-grained timber, strong, heavy and durable, according to Professor Kirk, greatly valued for mine-props, struts, caps, sleepers, water-tanks, bridge-planks and piles, also spars; the Maoris employ the bark for dyeing red and black and yellow, according to admixtures. It contains from 23 to 28 per cent. tannin and is therefore valued by the tanner, fetching a high price [Prof. Kirk]. This species also ascends in a diminutive form to alpine elevations.

Phyllostachys bambusoides, Siebold.

Himalayas, China and Japan. A comparatively dwarf Bamb but very hardy; the yellowish canes available for excellent wa ing-sticks [Griffith].

Phyllostachys nigra, Munro.* (*Bambusa nigra,* Loddiges.)

China and Japan. Whangee-Bamboo, reaching 25 feet in height. The stems nearly solid and becoming black. Has withstood severe frost in the south of France and at Vienna. Known to have grown 16 feet in six weeks. Bamboo-chairs and various utensils made of this species. As many as 600,000 walking-sticks of this plant have lately been imported into England in one year. The total of Bamboo-sticks exported from China and Japan in one year has latterly amounted to 5 millions. A Japanese species of this bambusaceous genus proved hardy in Scotland. P. viridi-glaucescens and P. aurea are perfectly hardy in England [Munro]; the latter withstood the severest winters of Edinburgh, with 0° F. [Gorlie].

Phymaspermum parvifolium, Bentham. (*Adenachæna parvifolia,* De Candolle.)

South-Africa. A dwarf, somewhat shrubby plant, fit to be naturalised on mere sandy ground. Praised by Professor McOwan as equal in value to Pentzia virgata for sheep-pastures.

Physalis Alkekengi, Linné.

The Strawberry-Tomato or Winter-Cherry. Middle and South-Europe, North-Africa, Middle Asia, extending to Japan; said to have come originally from Persia. Ripening in Norway to lat. 63° 26′ [Schuebeler]. A perennial herb. The berry, which is red and of a not unpleasant taste, has some medicinal value. The leaves contain a bitter principle—physalin.

Physalis angulata, Linné.

In many tropical countries, extending as a native plant to the northern parts of the United States and to Japan. An annual herb. The berries yellowish, edible. P. minima, L (*P. parviflora,* R. Br.), is closely allied, and extends into tropical Australia.

Physalis Peruviana, Linné.*

Temperate and tropical America, widely naturalised in many countries of the warmer zones. With double inaptness called the Cape-Gooseberry. A perennial herb; but for producing its fruit well it requires early renovation. The acidulous berries can be used as well for table-fruit as for preserves. Doubtless several other kinds of Physalis can be utilised in the same manner. In colder countries the P. Peruviana becomes annual. Seeds will keep for eight years. [Vilmorin].

Physalis pubescens, Linné.

Warmer regions of North- and South-America. Though annual, worth cultivation on account of its acidulous fruits, called the Gooseberry-Tomato or inaptly Barbadoes-Gooseberry, under which name also the very similar P. Barbadensis (Jacquin) is comprised.

Physorrhynchos Brahuicus, J. Hooker.

Persia, Scinde, Afghanistan, Punjab. A perennial herb, fond of somewhat saline soil. On careful cultivation it may form a new sort of kitchen-vegetable, as Dr. J. E. Stocks found the leaves, when boiled, a fair substitute for cabbage.

Pilocarpus pinnatifolius, Lemaire.*

The principal Jaborandi-plant of tropical and sub-tropical Brazil. The leaves and bark of this shrub, which contain essential oil and a peculiar alkaloid, are famed as an agreeable, powerful and quickly acting sudorific; recommended as a specific in diphtheria, as well as typhoid fever, and supposed to be also reliable in hydrophobia. [Continho, Baillon, Hardy, Guebler]. This bush is likely to endure the clime of milder temperate forest-regions. Like P. simplex, also an active sialagogue. Pilocarpin contracts the pupil. P. Selloanus has similar properties. Other Jaborandi-plants, all from Southern Brazil, are Piper Jaborandi (Vellozo), Bramia Monniera, B. gratioloides, B. colubrina, also Monniera trifoliata.

Pimenta officinalis, Lindley.

The Allspice. West Indies. A middle-sized tree. Flowers freely at Port Jackson, but does not ripen its fruit readily there [C. Moore]. In Ceylon it can be grown to about 3,000 feet elevation advantageously [Dr. Trimen]. Cultivated in Jamaica up to 4,000 feet [W. Fawcett]. Succeeds in Natal [J. M. Wood]. For the stick- and umbrella-trade large lots of the young saplings are exported [J. R. Jackson]. Requires soil rich in lime.

Pimpinella Anisum, Linné.

The Anise-plant. Greece, Egypt, Persia. An annual. The seed-like fruits enter into various medicines and condiments, and are required for the distillation of oil, rich in anethol. The herbage left after obtaining the seeds serves for fodder. The plant will bear seeds in Norway up to lat. 68° 40′ [Schuebeler]. The seeds retain their power of germination for three years [Vilmorin].

Pimpinella saxifraga, Linné.

Europe, Northern and Middle Asia. A perennial herb; its root used in medicine; a peculiar volatile oil can be distilled from the root. P. magna, L., is a closely allied species, and P. nigra, W., is a variety. The root of the last is particularly powerful.

Pimpinella Sisarum, Bentham. (*Sium Sisarum,* Linné.)

Middle and Eastern Asia, extending to Persia [Maximowicz], Valkjmia and Podolia [Rostafinski]. A perennial herb. The bunches of small tubers afford an excellent culinary vegetable. The taste is sweet and somewhat celery-like. The roots endure frost. The plant is cultivated up to lat. 63° 26′ in Norway [Schuebeler].

Pinus Abies, Du Roi.* (*Pinus picea,* Linné.)

Silver-Fir, Tanne. Middle and South-Europe, extending to the Caucasian mountains, ascending the Pyrenees to 6,000 feet. It will endure the climate of Norway to lat. 67° 66′ [Schuebeler]. A fine tree, already the charm of the ancients, attaining about 200 feet in height and 20 feet in circumference of stem, reaching an age of fully 400 years. A variety with pendent branches exists. It furnishes a most valuable timber for building as well as furniture, and in respect to lightness, toughness and elasticity it is even more esteemed than the Norway-Spruce, but it is not so good for fuel or charcoal; it is pale, light, not very resinous, and is mostly employed for the finer works of joiners and cabinetmakers, for sounding boards of musical instruments, largely for toys, also for lucifer-matches, for coopers' and turners' work, and for masts and spars. It also yields a fine white resin and the Strasburg-turpentine, similar to the Venetian. Besides the above normal form the following two main varieties occur:—P. Abies *var.* Cephalonica, Parlatore (*P. Cephalonica,* Endlicher), Greece, 3,000 to 5,000 feet above the sea. A tree, 60 feet high, with a stem-circumference of 10 feet. The wood is very hard and durable, and much esteemed for building. General Napier mentions, that in pulling down some houses at Argostoli, which had been built 150 to 300 years, all the woodwork of this fir was found as hard as oak and perfectly sound. The very resinous wood probably of a variety of this or an allied species was used by Stradivari and his sons for making the famous Italian violins in the last century.—P. Abies *var.* Nordmanniana, Parlatore (*P. Nordmanniana,* Steven), Crimea and Circassia, to 6,000 above the sea. Can be grown in Norway to lat. 61° 15′. This is one of the most imposing firs, attaining a height of about 100 feet, with a perfectly straight stem. It furnishes a valuable building-timber. The Silver-Fir is desirable for mountain-forests. It will grow on sand, but only half as fast as P. Pinaster. In Britain the upward growth is about 50 feet in 30 years. If the genera Abies, Picea, Tsuga, Pseudotsuga, Cedrus and Larix are to be maintained in the phytographic system and nomenclature, then Wellingtonia needs also again to be separated from Sequoia.

Pinus alba, Aiton.

White Spruce. From Canada to Carolina, up to the highest mountains. It resembles *P. picea,* but is smaller, at most 50 feet high. Exudes a superior resin. It bears the shears well, when trained for hedges, which are strong, enduring and compact [J. Hicks]. The bark richer in tannin than that of the Hemlock-Spruce. The timber well adapted for deal-boards, spars and many other purposes, but on the whole inferior to that of the Black Spruce. The tree grows in damp situations or swampy ground. Eligible for alpine regions. Hardy in Norway to lat. 70° 56′. P. Engel-

manni (Parry) is closely akin; it occurs in British Columbia; stem to 3 feet in diameter; wood excellent and durable [Dr. G. Dawson].

Pinus albicaulis, Engelmann.

British Columbia and California, ascending to 9,000 feet. Height to 60 feet. Extremely hardy, resisting the most boisterous weather, but never exceeding 40 feet in height [Sir Jos. Hooker]. Wood light, soft, rather brittle, but close-grained [Prof. Sargent]. Fruit-strobiles nearly globular, purplish, with short and thick scales. Bark whitish, scaly. This species has been referred by S. Watson to P. flexilis (James) as a variety. Seeds large, edible.

Pinus Alcockiana, Parlatore.

Japan, at an elevation of 6,000 to 7,000 feet. A fine spruce, often to 120 feet high, with very small blue-green leaves; the wood is used for light household-furniture. Buds purplish. P. tsuga and P. polita ascend there to the same height [Rein].

Pinus amabilis, Douglas.

Californian Silver-Fir. Northern California, Oregon, British Columbia, at elevations of from 4,000 to 7,000 or even 10,000 feet. A handsome fir, to 200 feet high; circumference of stem to 24 feet; the stem is branchless up to 100 feet. The tree passes under the name of the "Queen of the Forests" [Lemmon]. The wood is elastic, strong and hard, fit for masts and spars; it has a peculiar red color; spikes, nails and bolts hold firm and never corrode in it [Dufour], but according to a late account of "Canadian timbers" much less praiseworthy, perhaps according to differences in situations, soil and clime. Very closely allied to P. nobilis and also to P. grandis. Hemsley records as distinct from this P. lasiocarpa (Hooker), which gains a height of fully 250 feet and has branchlets with yellowish bark.

Pinus aristata, Engelmann.

California, at elevations of 8-10,000 feet in the Sierras. A pine, attaining about 75 feet in height, the stem three feet in diameter; leaves extremely short [Gibbons]. Fit for any alpine country. Referred by S. Watson as a variety to P. Balfouriana (Jeffrey).

Pinus Arizonica, Engelmann.

Arizona, California. This pine differs from P. ponderosa in glaucous branchlets, thinner leaves, constantly in fives and of different structure, and in thicker and shorter fruit-cones, with greater prominences on the scales [Engelmann, Sargent, Perry].

Pinus australis, Michaux.*

Southern Pine, also called Hard Pine, Georgian, Yellow Pitch-Pine, Long-leaved Yellow or Broom-Pine. Southern States of North-America. On sandy soil, constituting the main tree-vegetation on the "Pine-Barrens." The tree attains a height of about 100 feet, requires soil open to a great depth, and follows the "stratified drifts," consisting of gravel, sand and clay [Prof. Mohr]. Requires a long period of growth for full development [Farlow]. One of the least shade-enduring of all pines. It furnishes a superior timber for furniture and building, also for naval architecture, railway-ties and flooring, particularly eligible also for very tall flagstaffs; thus yields the principal yellow pine-wood of the lumber-trade. The wood is compact, straight-grained, very durable, of delicate shades of yellow and brown [C. Mohr], and has only a slight layer of sapwood. The tree is not so quick of growth as many other pines. According to Dr. Little, the tree produces 30,000 feet of first-class timber per acre. It is this species, which yields largely the American turpentine, as well as resin, pitch and tar. Great Britain in 1884 imported 23,000 tons oil of turpentine, value £560,000, and 73,500 tons resin, value £376,000: in 1889 the quantity was 20,200 tons oil of turpentine, value £663,000, and 66,800 tons of resin, value £291,000; by far the greatest portion of these two articles came from the United States, where P. Australis would yield a large share. The resin is fragrant. A solution of the oil, distilled from the turpentine in alcohol, is known as camphin. The turpentine is obtained by removing in spring and summer strips of bark, by chipping and collecting the effluence into appropriate boxes particularly applied. The first yield is the best; in the fourth year the tree becomes exhausted [Prof. C. Mohr]. The average annual yield during this time is 20 lbs. Porcher observes, that the tree shoots up devoid of branches for sometimes as much as 60 feet, and he calls it "one of the greatest gifts of God to man." The tree prevails, according to C. Mohr, where the silicous constituents of the drift-soil mingle with the outcrops of tertiary strata, and he observes, that forests of this pine cause grateful showers with wonderful regularity through all seasons. The emanations from pines, particularly the very resinous species, are antimalarian and antiseptic, as proved by residences near pine-forests, and by the use of hospital-buildings constructed of pine-wood. The so-called pine-wool, much prepared from the leaves of this species, has recently came into use for select mats [J. R. Jackson]. P. palustris (Miller) is by far the oldest name, but quite inappropiate.

Pinus Ayacahuite, Ehrenberg. (*P. Loudoniana,* Gordon).

In Mexico, at an elevation of 8,000 to 12,000 feet. An excellent pine, to 150 feet high, with a stem-diameter of three to four feet. It has the habit of P. excelsa, and is equal to it in its own line of beauty [Beecher] and in hardiness, yielding a much-esteem

white or reddish timber. Its cones are among the very largest, measuring as much as 15½ inches in length [Sir J. Hooker]. Furnishes a fragrant balsamic turpentine and resin, the latter used as incense [O. Finck].

Pinus Balfouriana, Jeffrey. (*P. aristata,* Engelmann.)

The "Foxtail-" or "Hickory-Pine." California to Colorado, up to 12,000 feet elevation. Height reaching 100 feet; trunk-diameter to 5 feet. Wood close-grained, tough, very strong [Sargent].

Pinus balsamea, Linné.

"Balsam-Fir," "Balm of Gilead-Fir." Canada, Nova Scotia, south to New England, Pennsylvania and Wisconsin. An elegant tree, to 40 feet high, which with Pinus Fraseri yields Canada-balsam (Balsam of Firs), the well-known oleo-resin. The timber is light, pale, soft and useful for furniture and implements. The wood is also of very particular value for superior violins [Dr. R. Tannasch]. Rate of circumferential stem-growth in Nebraska 26 inches at 2 feet from the ground in 12 years [Governor Furnas]. The tree does not attain a very great age. Sends a pleasant odor through the forest, regarded as salubrious, especially to phthisic patients, a remark which applies to many other pines. It thrives best in cold swampy places. Eligible for alpine regions; in Norway it is hardy to lat. 63° 26'.

Pinus bracteata, D. Don.

Southern California up to 6,000 feet. A very handsome fir, attaining about 150 feet in height, forming a slender, perfectly straight stem, not more than two feet in diameter. A somewhat older name is P. venusta (Douglas). The resin is used for incense. The young shoots, according to Hemsley, injured by spring-frosts in Britain.

Pinus Brunoniana, Wallich. (*P. dumosa,* D. Don).

Himalaya, descending to 8,000 and ascending to 10,500 feet. This fir attains a height of about 120 feet, and the stem a circumference of 28 feet [Sir J. D. Hooker]. Particularly eligible for alpine tracts. The timber is pale and soft; it does not stand exposure well.

Pinus Canadensis, Linné.*

"Hemlock-Spruce." In Canada and over a great part of the United States, on high mountains, as well as on undulating land. A very ornamental fir, to about 100 feet high, with a pale coa grained wood, remarkably durable when used for submerged wa works; also employed for railway-ties. According to A. G is one of the most graceful of spruces, with a light and spre spray. Schacht saw aged stems on which 440 wood-rings co

counted. Can be kept trimmed for hedges. Next to P. Strobus it is the highest pine of the Eastern States of North-America. The tree is extremely valuable on account of its bark, which is much used as a tanning material, containing 9 to 14 per cent. tannin. Ramspacher's analyses have given a still higher result. Bark is much liked as an admixture to oak-bark for particular leathers of great toughness, wearing strength and resistance to water. The extract of the bark for tanning fetches in the London market from £16 to £18 a ton, and is imported to the extent of 6,000 tons a year; the bark is stripped off during the summer months; it is of medicinal value also. The young shoots are used in making spruce-beer. P. Caroliniensis is the Hemlock-spruce of Carolina.

Pinus Canariensis, C. Smith.*

Canary-Pine. Canary-Islands, forming large forests at an elevation of 5,000 to 6,000 feet. A tree, reaching a height of 80 feet, with a resinous, durable, very heavy wood, not readily attacked by insects. It thrives well in Victoria, and shows celerity of growth. Will endure an occasional shade-temperature of 118° F. [W. I. Winter]. Growth in height at Port Phillip 45—50 feet in 20 years.

Pinus Cedrus, Linné.*

Cedar of Lebanon. Together with the Atlas-variety on the mountains of Lebanon and Taurus, also in North-Africa and Cyprus; the var. C. Atlantica at elevations of a few or several thousand feet. The tree grows to a height of about 100 feet, with a heavy trunk sometimes 46 feet in circumference [Booth] and attains a very great age. Goeppert and Russegger allot to Lebanon-Cedars an age reaching to the commencement of the Christian era. The wood is of a light reddish color, soft, almost inodorous, easy to work, and much-esteemed for its durability.

Pinus Cedrus, *var.* Deodara.*

Deodar-Cedar. On the north-western Himalaya-Mountains, also in Afghanistan, 3,000 to 12,000 feet above the sea-level. A majestic tree, reaching a height of more than 300 feet, and sometimes over 40 feet in circumference of stem. The wood is of a light-yellow color, very close-grained and resinous, strongly and agreeably scented, light, extremely durable, well resisting the vicissitudes of a changeable clime, and furnishes one of the best building-timbers known. Pillars of Kashmir-mosques, made of this wood, found sound after 400 years, and bridges of still greater antiquity are in existence. White ants hardly ever attack the heartwood. Boats built of this wood have lasted about 40 years. It is also extensively used for canal-edges and for railways. The trees should not be felled too young. It yields a good deal of resin and turpentine. A humid clime very much accelerates the growth of this pine, which would come best and quickest to its development in forest-ranges.

Deodars will endure, when not too young, an exceptional temperature of 118° F. in the shade [W. I. Winter], yet the tree also bears the cold of Southern Norway. Rate of growth at Port Phillip, 40 to 50 feet height in 20 years.

Pinus Cembra, Linné.*

The Zirbel-Pine. On the European Alps, also in Siberia and Tartary, extending to Kamtschatka, the Kuriles and Arctic America; reaches to 7,000 feet in the Swiss Alps, yet less hardy than P. Laricio, although from high Alps; it grows still to a height of 60 feet at Christiania [Schuebeler]. Attains a height of about 120 feet, the stem gets fully 4 feet in diameter, but the growth is slow. It likes humus-soil. The wood is of a yellow color, soft and resinous, of an extremely fine texture, and is extensively used for carving and cabinet-work. The seeds are edible, and when pressed yield a great quantity of oil, as much as 47 per cent., according to Schuppe. A particular turpentine is also obtained from this pine, called Carpathian balsam.

Pinus cembroides, Zuccarini.* (*P. Llaveana,* Schiede and Deppe.)

Mexican Swamp-Pine. A small tree, to 30 feet high, growing at elevations from 8,000 to 10,000 feet. The timber is not of much use, but the seeds are edible and wholesome, and have a very agreeable taste.

Pinus Cilicica, Antoine and Kotschy.

Cicilian Silver-Fir. Asia-Minor. 4,000 to 6,500 feet above sea-level. A handsome tree of pyramidal growth, to 160 feet high. Quite hardy in climes like that of Vienna. The wood is very soft, and used extensively for the roofs of houses, as it does not warp.

Pinus concolor, Engelmann.

The great White Silver-Fir. North-Western America to Arizona and New Mexico, at elevations of 8,000 to 9,000 feet. Nearest allied to P. grandis. A fir, reaching 150 feet in height; trunk to 4 feet in diameter. The wood is tough, eligible for building-purposes and other substantial work [Vasey]. It does not warp, shrinks hardly at all, makes choice ceilings, and needs less paint than most other timber [Kellogg]. Leaves whitish on both sides from abundant stomata.

Pinus contorta, Douglas.* (*P. Murrayana,* Balfour; *P. Bolanderi,* Parlatore.)

On high damp ranges in California, Oregon and British North-Western America; also abundant on the mountains of Colorado; very eligible for clothing rocky hill-sides [Meehan]. In California this pine forms dense thickets along the coast, and is in this respect as valuable as P. Laricio, P. Pinaster and P. Halepensis in Europe,

as a shelter-tree in stormy localities. Dr. Gibbons remarks of this pine, which vernacularly is called Tamarak or Hack-me-tack, that its size has generally been underrated. At the foot of the Sierra and on mountains 8,000 feet high he saw it in great numbers, forming one of the most stately of forest-pines, not rarely attaining a height of 150 feet and 4 feet in stem-diameter. The timber is pale, straight-grained and very light; there considered the best and most durable material for dams and for general building purposes. It furnishes sea-ports with piles and masts; yields also railway-ties. Its value is beyond calculation. Dr. G. Dawson notes, that the cambium-layer is so saccharine, as to afford food to the autochthones.

Pinus Coulteri, D. Don.*

California, on the eastern slope of the coast-range, at elevations from 3,000 to 4,000 feet. A pine of quick growth, attaining a height of about 100 feet, with a trunk about 4 feet in diameter; with P. Ayacahuite, P. Montezumæ, P. Lambertiana, P. Sabineana and P. excelsa it has the largest cones of all pines, comparable in size and form to sugar-loaves. The nuts are nutritious. Wood brittle.

Pinus Cubensis, Grisebach.* (*P. Elliottii,* Engelmann.)

Swamp-Pine, Slash- or Bastard-Pine. Higher mountains of Cuba, also in the Southern States of Eastern North-America. Allied to P. Tæda. Likes moist, sandy, flat lands. Height of tree to 120 feet, of clear stem to 70 feet; growth comparatively quick, overpowering P. australis, Yields some turpentine and resin [Prof. C. Mohr]. Wood heavy, exceedingly hard, very strong, tough and durable, hardly inferior to that of P. australis [Colman]. P. Bahamensis Grisebach] is a closely cognate Pine, restricted to the Bahamas.

Pinus densiflora, Siebold and Zuccarini.

The "Akamatsu-Pine" of Japan, where it forms along with P. Thunbergi extensive forests at 1,000 to 2,000 feet above sea-level. It is hardy at Christiania. Attains an age of several centuries [Rein]. Height to about 100 feet; stem finally very stout. The timber is excellent for building; it is less resinous than that of P. Thunbergi [Dupont].

Pinus Douglasii, Sabine.*

Oregon-Pine or Fir, called also the Yellow Pine or Fir of Puget-Sound, where it yields the principal timber for export, and is therefore of great commercial value in the lumber-trade. It extends from Vancouver's Island and the Columbia-River through California to Northern Mexico from the coast up the mountains to 9,000 feet altitude. The maximum-height known is nearly 300 feet; the

greatest diameter of the stem 14 feet. The largest trees to be found in the coast-region. Locally of quicker growth than most other pines there. Can be grown very closely, when the stems will attain, according to Drs. Kellogg and Newberry, a height of over 200 feet without a branch. A densely wooded forest will contain about 36 full-grown trees to an acre. The timber is fine and clear-grained, heavy, strong, soft, and hence easily worked, yet firm and solid, splendid for masts and spars, ships' planks and piles; also valuable for flooring, being for that purpose regarded as the best of California [Bolander]. It will bear a tension of 3 to 1 as compared with the Sequoias. It is the strongest wood among conifers on the North-Pacific coast, both in resisting horizontal strain end perpendicular pressure. Sub-alpine localities should be extensively planted with this famous tree. It requires deep and rich soil, and likes shelter; its growth is as rapid as that of the larch; it passes in various localities as Black and Red Spruce. Both in clayey and light soil it attains 50 feet in about eighteen years; it requires however a moist forest-clime for rapid growth. The bark is employed for tanning.

Pinus edulis, Engelmann.*

New Mexico. A pine, not tall, very resinous. Wood easily split. One of the best for fuel [Meehan]. It yields the "Pino"-nuts, which are produced in immense quantities, and are of very pleasant flavor [Sargent]. So closely cognate to P. monophylla, that Dr. Newberry and Prof. Meehan regard it as a mere variety.

Pinus excelsa, Hamilton *

The Lofty or Bhotan-Pine. Himalaya, forming large forests, at from 5,000 to 12,500 feet elevation; also in Macedonia and Montenegro. A fine tree, at length about 150 feet high, furnishing a valuable, close-grained, soft and easily workable wood, which ranks among Himalayan pine-woods for durability next to Deodar-timber [Stewart and Brandis]; the wood is highly recommended for patterns in foundries, further for levelling-staves and cot-planks [Watson]. This pine also furnishes a good quantity of turpentine. Under cultivation it shrinks before a fierce summer-sun [Beecher]; but will bear the winter of Christiania [Schuebeler]. Cones often 15 inches long [Sir J. Hooker]. This tree produces seeds early and copiously; gets disseminated easily even on steep bare declivities [Brandis].

Pinus firma, Antoine.

Japan, at 2,000 to 4,000 feet above the sea-level in humid valleys. A lofty tree of the habit of the Silver-Fir. Attains an age of to 300 years, without any decay of the stem. The best ti comes from the colder regions [Prof. Luerssen]. The wood is soft and fine-grained, employed particularly by local coope upholsterers.

Pinus flexilis, James.

The White Pine of the Rocky Mountains, also known as the Bull-Pine. From New Mexico to British Columbia, ascending to 13,000 feet. Prefers the limestone-formation. A valuable fir for cold regions. It attains a height of 150 feet, according to Dr. Gibbons, but Mr. J. Hoops states, that it is of slow growth. Stem to 5 feet thick (Sereno Watson). Wood pale, soft and compact, of fine texture, according to Prof. Sargent intermediate between that of P. Strobus and P. Lambertiana. Dr. G. Dawson noted, that the seeds afford food to the autochthones.

Pinus Fortunei, Parlatore. (*Abies Jezoensis,* Lindley.)

China, in the neighbourhood of Foo-Chow-Foo. A splendid fir, to 70 feet high, somewhat similar in habit to P. Cedrus.

Pinus Fraseri, Pursh.

Double Balsam-Fir. On high mountains of Carolina and Pennsylvania. This tree, which grows to a height of about 20 feet only, yields with P. balsamea the well-known Canada-balsam. The tree is hardy at Christiania still.

Pinus Gerardiana, Wallich.

Nepal Nut-Pine. In the north-eastern parts of the Himalayas at an elevation of 10,000 to 12,000 feet, extending to Afghanistan. With P. Deodara, P. excelsa, P. Webbiana, P. Smithiana and Juniperus excelsa reachiug the highest regions of pine-forests in Southern Asia. The tree attains a height of 60 feet, with a comparatively short stem, exceptionally 10 feet in girth, and produces very sweet edible seeds, also turpentine. Hoopes refers to it as remarkable for the copiousness of its resin. In reference to the nut-seeds the proverb prevails at Kunawar, "One tree a mans life in winter."

Pinus glabra, Walter.

From Florida to the Mississippi, particularly in low hummocks [Dr. Chapman]. Allied to P. mitis. It attains, according to Prof. C. Mohr, a height of about 80 feet, stem-diameter to 3 feet. Requires good moist soil; growth comparatively quick; shade enduring. Wood light, soft, easily worked, not resinous, fit as regards building purposes only for inside work [Hon. J. Colman]. Wood comparable to that of P. Strobus [Dr. Porcher].

Pinus grandis, Douglas.

From California to British Columbia. Great Silver-Fir, also known as the Yellow Fir. A splendid quick-growing fir, to 200 feet high and upwards, growing best in moist valleys of high ranges. The stem occasionally attains a diameter of 7 feet at 130 feet from the ground, and of 6 feet at 200; concentric wood-growth

of stem as much as 1 inch in a year; height reached by the tree in Wales 75 feet in 33 years [A. D. Webster]. Trees occur of 15 feet stem-diameter and 320 feet high. The wood is pale and soft, too light and brittle, according to Dr. Vasey, for general purposes; while Prof. Brewer asserts, that it is employed for boards, boxes, cooperage, and even much sought for shipbuilding, but it seems fit only for inside work; it is of pleasant scent. Rate of upward growth in favourable places about $2\frac{1}{2}$ feet in a year. Hardy in England [Hemsley]. P. subalpina (Engelmann) is closely cognate.

Pinus Griffithii, Parlatore. (*Larix Griffithii,* J. Hooker and Thompson.)

The Himalayan Larch. Descends to 8,000 feet and ascends to 12,000 feet. Timber pale, soft, without distinct heartwood, one of the most durable of all pine-timbers [Stewart and Brandis]. P. Ledebourii (Endlicher) is the Siberian Larch.

Pinus Halepensis, Miller.* (*P. maritima,* Lambert.)

Aleppo-Pine. South-Europe and North-Africa, South-Western Asia. This well-known pine attains a height of 80 feet, with a stem to 5 feet in diameter. The timber of young trees is pale, of older trees dark-colored; it is principally esteemed for ship-building, but also used for furniture. The tree yields a peculiar kind of turpentine, as well as a valuable tar. Although ascending mountains in South-Europe to the height of 4,000 feet, it thrives best in sandy coast-lands, where in ten years it will measure 25 feet, and finally will become a larger tree than on firmer lands. M. Boitel has published a special work on the importance of this pine for converting poor sand-land into productive areas, referring also to P. silvestris and P. Laricio for the same purpose. According to Mr. W. Irvine Winter it will resist an occasional heat of 118° F. in the shade. We find the Aleppo-Fir one of the best of evergreen avenue-trees in Victoria, as first proved by the writer. It is content with the poorest and driest localities, and also here comparatively rapid in growth. Does also particularly well on limestone soil, its roots penetrating far into the crevices of the rocks [Dr. Henry Bennett].

Pinus Hartwegii, Lindley.

Mexico, 9,000 to 14,000 feet above sea-level. A pine, reaching 150 feet in height, with a very durable wood of a reddish color; it yields a large quantity of resin.

Pinus Hookeriana, McNab. (*Abies Hookeriana,* Murray.)

California, at 5,000 to 6,000 feet elevation. A fir, allied to P. Pattoniana, but distinct [Dr. McNab]. Height of tree to about 300 feet. Stem perfectly straight. Wood hard, of a reddish color, with handsome streaks. Not a resinous tree. Hardy in Middle Europe.

Pinus Hudsonica, Poiret. (*P. Banksiana,* Lambert.)

Grey Pine. Colder parts of North-America, both eastern and western, up to 64° north-latitude. Height of tree to as much as 100 feet; in the cold north only a shrub. Its wood is light, tough, resinous and easily worked; locally used for railway-ties. Extends further north than any other pine in America [Dawson and Macoun]. Should prove valuable for alpine forests.

Pinus inops, Solander.

Eastern North-America. The Jersey-Pine. A tree, content with barren soil, attaining a height of 40 feet, available for fixing drift-sand on coasts. Easily disseminated. Remarkably rich in resin, hence to be classed with pines most desirable for sanitary plantations. Wood reddish-yellow. P. Virginiana (Miller) is by far the eldest name.

Pinus insignis, Douglas.* (*P. radiata,* D. Don.)

California. A splendid dark-green pine, fully to 100 feet high, with a straight stem, occasionally 8 feet in diameter. It is the quickest-growing of all pines, a seedling one year old being strong enough for final transplantation; it has been noticed to grow fully 5 feet annually in light soil near Melbourne. Mr. J. Dickinson found it to attain a height of 70 feet, with a stem-girth of 5 feet, in 13 years at Port Phillip. Although Cupressus macrocarpa grows nearly as fast, that tree is not so indifferent to soil as P. insignis, which will brave even stagnant humidity in stiff soil. Preferable in mild climes for street-planting to trees with annually deciduous leaves, as the small yearly fall of foliage does not choke gutters and drains, nor becomes so offensive in moist decay; thus even of sanitary effect. Never introduced into Victoria as a timber-tree, but to impart quickly and uninterruptedly a magnificent verdure to towns and landscapes, and to afford early shelter. According to W. I. Winter it will endure unhurt exceptional exposure to 118° F. in the shade. Even more apt to catch fire than most pines. In the United Kingdom it suffers greatly from the attacks of the Pine-Beetle, Hylurgus piniperda [Lawson]. The wood is of inferior technic value; but this tree can be utilized for obtaining tar and pitch. It bears exposure to the sea at the very edge of the coast. Produces fruit-cones only at somewhat advanced age. Mr. J. Kruse, on the author's suggestion, subjected the foliage to distillation, obtaining oil in 0·01 quantity of 0·845 specific gravity, of 293° F. boiling point, and of a pleasant penetrating odor, reminding of Geneva-gin. Prof. Don having named and described this tree under two names simultaneously, the later name, given by Douglas, may remain adopted.

Pinus Jeffreyi, Murray.

California. A pine, to 150 feet in height; stem-diameter to 4 feet. Hardy at Christiania, Norway. Recommended particularly

for rearing on slopes of higher mountains, as it suffers from any drought. The wood serves in the trade as coarse lumber. The glaucous branchlets of aromatic fragrance with thinner and greyish leaves, the greater size of the fruit-cones with thin and recurved spines to the scales, the larger nutlets and more numerous cotyledons separate this pine from P. ponderosa [Engelmann, Sargent, Perry].

Pinus Jezoensis, Antoine.

Amur and Japan. This spruce is closely allied to the N.W. American P. Sitchensis. Picea Ajanensis (Fischer) is identical. For synonyms see Dr. Masters' essay in the Journal of the Linnean Society 1881.

Pinus Kæmpferi, Lambert.

Chinese Larch, also called Golden Pine. North-Eastern China. This is the handsomest of all the larches; it forms a transit to the cedars. Resists severe frost. It is of quick growth and attains a height of 150 feet. The leaves, which are of a vivid green during spring and summer, turn to a golden-yellow in autumn. The wood is very hard and durable.

Pinus Kasya, Royle.

Kasya and also Burmah, from 2,000 to 7,000 feet. Closely related to P. longifolia. Attains a height of 200 feet. Wood very resinous, somewhat fibrous, rather close-grained, pale-brown with darker waving [Kurz.] The resin an article of commerce [Sir Jos. Hooker].

Pinus Koraiensis, Siebold and Zuccarini.

Kamtschatka, China and Japan. A handsome pine, often to 40 feet high, produciug edible seeds.

Pinus Lambertiana, Douglas.*

Shake-, Giant- or Sugar-Pine. British Columbia and California, mostly at great altitudes. A lofty tree, of rapid growth, upwards of 300 feet high, with a straight stem attaining 60 feet in circumference. It holds in most places preëminence in beauty and size over accompanying pines, and reaches an age of 600 years [Dr. Vasey]. It thrives best in sandy soil, and produces a soft, pale, straight-grained wood, which for inside work is esteemed a any other pine-wood in California, and obtained in large quanti it is especially used for shingles, flooring, and for finishing purp by joiners and carpenters. The tree yields an abundanc remarkably clear and pure resin, which from trees partially

is of sweet taste, and eaten by the natives. The cones may be 19 inches long; the seeds are edible. This pine would come to perfection best in the humid regions of higher mountains. P. reflexa (Engelmann) is an allied large species with smaller fruit, occurring in Arizona.

Pinus Laricio, Poiret.* (*P. maritima,* Miller.)

Corsican Pine. South-Europe, ascending to about 6,000 feet, It attains a height of 150 feet. A splendid shelter-tree, particularly for the coldest regions. One of the best pines to thrive in the southern part of the Middle Island of New Zealand [Waugh]. It is also cultivated at Christiania. It will succeed on stiff clay as well as on sandy soil, even on sea-sand. The wood is pale, towards the centre dark, very resinous, coarse-grained, elastic and durable, and much esteemed for building, especially for water-works; valuable also for its permanency underground. There are three main-varieties of this pine, namely, P. L. Poiretiana in Italy, P. L. Austriaca in Austria, P. L. Pallasiana on the borders of the Black Sea. The tree grows best in calcareous soil, but also in poor sandy ground, where however the timber gets not so large nor so good. It yields all the products of P. silvestris, but in greater quantities, being perhaps the most resinous of all pines. Assumed to attain an age of 500 years [Langethal]. The Austriaca variety attained a stem-girth of nearly 2 feet in 10 years, when cultivated in Nebraska [Governor Furnas]. This species is regarded by some as even preferable for timber-rearing to P. silvestris and P. Larix. Rate of upward growth $1\frac{1}{2}$-2 feet in a year.

Pinus Larix, Linné.*

Common Larch. On the European Alps, up to 7,000 feet. A tree of quick growth in cool localities; adapted to poor soil, its foliage as in all larches deciduous. It attains often a height of 100 feet, sometimes rising even to 160 feet, and produces a valuable timber of great durability, which is used for land- and water-buildings, and much prized for ship- and boat-building; for staves of wine-casks almost indestructible, not allowing the evaporation of the spirituous contents [Simmonds], also much employed for pumps. The Briançon-Manna exudes from the stem. Larch-trees, cut in Bohemia, have shown over 500 annual rings in their wood [Langethal]. Larch-timber lasts three times longer than that of the Norway-Spruce, and although buoyant and elastic it is tougher and more compact; it is proof against decaying effect of water, not readily igniting, and heavier and harder than any deal [Stauffer]. The Venetian houses, constructed of larch-wood, showed for almost indefinite periods no symptoms of decay. This wood is also selected for the most lasting panels of paintings. The bark is used for tanning and dyeing. The tree is also of great importance for its yield of Venetian turpentine, which is obtained by boring holes into the

stem in spring; these fill during the summer, supplying from half to three-quarters of a pint of turpentine. In Piedmont, where they tap the tree in different spots, and let the liquid continually run, it is said, that from seven to eight pints may be obtained in a year; but the wood suffers through this operation. The larch is grown in Norway to lat. 66° 5′; in 63° 26′ a tree still attained a height of over 70 feet [Professor Schuebeler]. P. L. *var* Rossica, the Russian Larch, grows principally on the Altai-Mountains, from 2,500 to 5,500 feet above sea-level. The species would be important for uplands, particularly alpine country, even for peatbogs.

Pinus leiophylla, Schiede and Deppe.

At elevations of from 7,000 to 11,000 feet on the mountains of Mexico. A pine to as much as 90 feet high. A very resinous species, according to Mr. Hugo Finck. The wood is excessively hard.

Pinus leptolepis, Endlicher.

The Karamatsou or Japan-Larch. In Japan, between 35° and 48° north-latitude, up to an elevation of 9,000 feet. Never a very tall tree, still occasionally rising to 100 feet, with a stem-diameter to 4 feet. Thrives best in a cool dry climate. The timber is heavy and durable, pale-yellowish with reddish-brown centre, used for ship- and house-building as well as for utensils, but especially sought for underground-work [Prof. Luerssen].

Pinus longifolia, Roxburgh.*

Emodi-Pine or Cheer-Pine. On the Himalayan mountains, from 2,000 to 9,000 feet. A handsome tree, with a branchless stem for 50 feet, the whole tree attaining a maximum-height of somewhat over 100 feet, the girth of the stem 12 feet. Does not like much shade. Growth in height at Port Phillip about 40 feet in 20 years. The wood is resinous, and the red variety useful for building; it yields a quantity of tar and turpentine. The branches are used for torches by the rural population of its native country [Dr. Brandis]. The tree stands exposure and heat well. The Honorable W. I. Winter found it endures an occasional shade-temperature of 118° F.

Pinus Massoniana, Lambert.

Chiua. A good-sized pine, with widely spreading ramifications. The wood is durable, and, when well-seasoned, is much employed as material for tea-boxes. The tree endures the winter-cold of Southern Norway [Schuebeler]. Prof. C. Koch regards P. Sinensis (Lambert) as a distinct species.

Pinus Merkusii, Junghuhn.

Burmah, Borneo, Sumatra and Philippine Islands, there wit insularis, chiefly at elevations of from 3,000 to 4,000 feet. A

pine. The only species of Pinus, which extend south of the equator. Closely related to P. Massoniana. Wood exceedingly resinous [Brandis]; stems valuable for masts and spars, according to Mr. Gamble. Weight of wood about 50 lbs. per cubic foot. The resin of this pine resembles Damar [Wiesner].

Pinus Mertensiana, Bongard.

Western Hemlock-Spruce. North-Western America. Of unusually quick growth, even on poor soil in the cool climes congenial to this tree. The wood is pale, tough and very soft, but is often used for building. This fir gains a height of about 200 feet, with a stem 4 to 6 feet in diameter; the bark is in great repute for tanning; the roots yield strong fibres, even for seines and nets; the tender sprigs are the characteristic ingredient, required for making spruce-beer locally; the tree yields also much resin [Dr. Kellogg]. Though naturally so tall a tree, it can young be trained and trimmed to the best of garden-hedges of a lovely green [Prof. Bolander].

Pinus mitis, Michaux.*

Yellow Pine of Eastern North-America, extending to Missouri and Texas, called also Short-leaved Pine, in contrast to P. australis. In dry sandy and more particularly somewhat clayey soil attaining a height of about 90 feet; eligible for rocky ridges. Wood yellowish, compact, hard, durable, fine-grained, moderately resinous, valuable for flooring, cabinet-work and ship-building, and even for railway-sleepers. Much exported from Florida [G. Damkoehler]. According to Dr. Vasey it commands a higher price even than that of P. Strobus. The seeds are smaller than those of other North-East American true pines, hence easier of transit in quantity [Meehan]. All points taken together probably with P. Cubensis the best pine for future forestry in the Southern States of North-America [Hon. J. Coleman], an opinion of which advantage should be taken in the Victorian clime.

Pinus monophylla, Torrey.

Stone- or Nut-Pine of California, on the Sierra Nevada and Cascade-Mountains, up to 6,500 feet. Never very tall. It thrives best on dry limestone-soil. The large seeds are edible, of almond-like taste, and consumed in quantity by the natives. Height of tree generally about 35 feet, but occasionally as much as 80 feet; stem not of great thickness. This species is not of quick growth. Wood pale, soft, very resinous, much used for charcoal.

Pinus montana, Du Roi. (*P. pumilio,* Hænke.)

On the Alps, Pyrenees and Carpathians, also in Greece, up to the highest point of woody vegetation, covering large tracts, and thriving on the poorest soil. In Norway it will live to lat. 70° 4′ [Schuebeler]. This pine grows to about 25 feet high, but in favorable localities to 50; it yields much oil of turpentine. The wood

is used largely for carving. Only available to advantage for highlands. The oil, distilled from the foliage of this and many other pines, is a safe anthelmintic [Dr. H. Pinkney].

Pinus Montezumæ, Lambert. (*P. Devoniana,* Lindley; *P. Grenvillea,* Gordon.)

Mexico. A handsome pine, to 80 feet high; wood pale, soft and resinous. Cone attaining a length of 15 inches [Dr. Masters].

Pinus monticola, Douglas.

From British Columbia to California, at an elevation of 7,000-10,000 feet. This pine thrives best in poor soil of granite-formation, and attains a height of about 200 feet, with a stem often 7 feet thick. The wood is pale, close-grained, similar to that of P. Strobus. Dr. Gibbons observes, that this species is less than half the size of P. Lambertiana, but in all other respects resembles it. Woodmen are very pronounced in their statement, that there are two kinds of sugar-pine, both growing in close proximity to each other. Mr. J. Hoopes states, that the wood is similar to that of the White Pine, therefore pale and soft, but tougher. Dr. G. Dawson says, that the aborigines use also the seeds of this pine for food.

Pinus muricata, D. Don.

Bishop's Pine. California, in the coast-region, up to 2,000 feet. This hardy pine grows ordinarily to about 40 feet, but reaches 120 feet under favorable circumstances. It might be utilized for wind-breaks [Dr. Gibbons]. Endures the clime of Middle Europe. Rate of growth near Melbourne about 30 feet in ten years [C. French]. Did particularly well in the south of New Zealand [Th. Waugh]. The fruit-cones persist for many years [Sereno Watson].

Pinus nigra, Aiton. (*Abies rubra,* Michaux.)

Black Spruce. Eastern America, occurring extensively between 44° and 53° north latitude. In Norway it will grow to lat. 63° 45′ [Schuebeler]. This tree, which is termed Double Spruce by the Canadians, likes humid sheltered localities, attains a height of about 70 feet, and furnishes a light elastic timber of pale color, excellent for yards of ships; largely sawn into boards and quarterings; has also come extensively into use for paper-pulp. The spruce-lumber of the eastern markets in the United States is chiefly furnished by this species [Sargent]. The young shoots are used for making spruce-beer, and the small roots serve as cords. The tree prefers poor and rocky soil, but a humid cool clime, and is best available for mountainous localities inaccessible to culture. Mr. Cecil Clay estimates, that 20,000 cubic feet of timber can be obtained from this tree on one acre of ground.

Pinus nobilis, Douglas.

Noble White Fir; but also known as Red Fir. Oregon and its vicinity; forms there extensive forests at 6,000 to 8,000 feet. A majestic tree, attaining a height of 320 feet [Brewer, Gardner], with regular horizontal branches. Timber splendid. P. magnifica (Murray) is a variety. Hardy in Middle Europe.

Pinus Nuttallii, Parlatore.

The Oregon-Larch, at elevations of from 3,000 to 6,000 feet. According to Dr. Gibbons, one of the most graceful trees. Stem straight, frequently 200 feet to the first limb. Timber readily fissile, very strong and durable [Dufur], tough, light and elastic; it can also be employed in water-work [Dr. Kellogg]. Tree only available for cool mountain-regions, to serve commercial final purposes.

Pinus obovata, Antoine. (*P. Schrenkiana,* Antoine.)

North-Eastern Europe and Northern Asia. Somewhat like the Norway-Spruce. Wood soft and pale, locally used for furniture and household-implements, also for packing boxes of great durability [Regel].

Pinus orientalis, Linné.

Sapindus-Spruce. Asia Minor, ascending to 6,600 feet, thus becoming alpine. Hardy in Christiania. The tree rises to about 80 feet, and somewhat resembles the Norway-Spruce. The wood is exceedingly tough and durable.

Pinus Parryana, Engelmann. (*P. Llaveana,* Torrey.)

California. One of the pines with edible nuts. Allied to P. monophylla.

Pinus parviflora, Siebold and Zuccarini.

The "Imekomatsou." Kuriles and Japan. A middle-sized pine of longevity; ascends to Alpine heights. Much used as an avenue-tree. Wood valuable for furniture and boat-building. It is harder than that of P. Thunbergi and P. densiflora [Dupont].

Pinus Pattoniana, McNab.

California, restricted to elevations above 5,000 feet, advancing thence to the glacier-region in a gradually dwarfed state. This fir rises to a maximum-height of 150 feet, the stem enlarging sometimes at the base to a diameter of 13 feet [Jeffrey].

Pinus patula, Schiede and Deppe.

Mexico, at elevations of from 6,000 to 12,000 feet. A graceful pine, becoming 80 feet high.

Pinus pendula, Solander. (*P. microcarpa,* Lambert.)

Small-coned American Larch, Black Larch or Tamarack. From Labrador and Canada to Virginia, delighting in swampy ground. A pine of pyramidal growth, to 100 feet high. The timber is pale, heavy, resinous, and as highly valued as that of the common larch; it is close-grained, well-adapted for underground-work; it combines lightness, strength and durability; much sought by ship-builders, as for knees, bends and ship-garlands it cannot be surpassed [Robb]; much in use also for railway-ties. Rate of circumferential stem-growth in Nebraska two feet in ten years [Furnas]. P. laricina [Du Roi] is by far the oldest name for this larch, as pointed out by Prof. C. Koch.

Pinus picea, Du Roi.* (*P. Abies,* Linné.)

Norway-Spruce, Fichte. Middle and Northern Europe and Northern Asia, rising from the plains to an elevation of 4,500 feet, and forming extensive forests. It exceeds even the birch in endurance of cold. Indigenous in Norway to latitude 69° 30′ [Schuebeler]. Adapted to most kinds of soil. The tree attains a height of 150 feet or even more, and furnishes an excellent timber, commonly known under the name of White Deal, for building, furniture, flooring, masts, spars, ladders and oars. Stems of 6 feet diameter are on record with more than 200 wood-rings. It also produces the Burgundy-pitch in quantity, while the bark is used for tanning. Though enduring dry summers, this spruce would have to be restricted for timber-purposes to damp mountains. A variety with pendant branches occurs. Hemsley mentions other forms of this spruce, and indeed many varieties of other species of Pinus. Britain alone imported in recent time pinewood to the value of nine millions sterling annually, of which P. picea must have furnished a considerable portion. The import of dealwood into Victoria from Europe and America during 1887 came in value to about half a million.

Pinus Pinaster, Solander.* (*P. maritima,* Poiret and De Candolle.)

Cluster-Pine. From the shores to the mountains of the countries on the Mediterranean Sea. The tree rises to about 60 feet in height. The wood is soft and resinous; it yields largely the French turpentine. Among the best of plants for consolidating sandy coasts, and for converting rolling sands into pastoral and agricultural la For ease of rearing and rapidity of growth one of the most imp tant of all pines. Average-growth at Port Phillip 40 feet i years. On the testimony of Mr. J. Hoopes, it does not thrive on calcareous soil. Hon. W. I. Winter observed P. Pinaste

the allied P. Pinea to withstand an occasional shade-temperature of 118° F. A tree, 60 to 70 years old, heavily tapped, yields 12 to 16 lbs. of turpentine, equal to 4 lbs. of resin, the rest being oil of turpentine [Simmonds]. The tree comes into full flow of turpentine at about 25 years, and the tapping process, if only a slight one, is endured by this tree for an enormous length of time. Thus the annual production of resin from a good tree fluctuates between 5 and 8 lbs. The quantity of resin gathered in France during 1874 was about sixty million pounds [Crouzetter-Desnoyers]. The felling of up-grown pines, planted with wise foresight for antimalarian and other hygienic purposes at places of centres of population, can but be regarded as most reprehensible, when the simple reason of such destruction consists in replacing the pines by other perhaps more fashionable but less sanitary trees. Under the shelter of a wooden palisade near high-water mark on coast-sands the seeds of the Cluster-Pine are sown along with those of the Lyme, Marram, Furze and Broom-plant, the ground thus sown being covered with brush-wood, to prevent the sand from moving. In France, north of the Loire, the P. Pinaster is not reared, as there it will no longer yield a rich supply of turpentine [Colonel Bailey in Indian Forester XIII., 450].

Pinus Pinceana. Gordon.

Mexico, up to 9,000 feet above the sea-level. A very remarkable pine, frequently to 60 feet high, having drooping branches like the Weeping Willow. Most desirable for cemeteries.

Pinus Pindrow, Royle.

Himalayan mountains, 7,000 to 12,000 feet above the sea-level. A fine, straight-stemmed fir, becoming 190 feet high; cones purple. Considered by Stewart and Brandis a variety of P. Webbiana.

Pinus Pinea, Linné.*

Stone-Pine. Countries bordering on the Mediterranean Sea; extends to the Canary-Islands. Height of tree 80 feet; top rather flat. The wood is whitish, light, but full of resin, and much used for furniture, naval architecture and general building purposes. The seeds are edible, but of a resinous though not disagreeable taste; they should be left in the cones until they are about to be used, as otherwise they speedily become rancid; they only ripen in their third year. This pine grows as easily and almost as quickly as the Cluster-Pine. The bark contains much tan-principle.

Pinus Pinsapo, Boissier.

Spanish Fir. Spain and North-Africa, at from 3,000 to 6,000 feet elevation. A tree to 70 feet high, with branches from the ground. The timber is similar to that of the Silver-Fir and resinous. Thrives best on calcareous soil [Dr. Masters]. Proved the quickest

growing of European Firs in Tasmania [F. Abbott]. A closely cognate tree is the Algerian Fir, P. Numidica (Lannoy), which occurs intermixed with the Atlas-Cedar at elevations from 4,000-6,000 feet.

Pinus polita, Antoine.

Japan and Kurile-Islands. A tall superb spruce, forming large forests on the mountain-ranges [A. Murray]. Resists severe frost. Allied to P. Smithiana. Wood much like that of P. Alcockiana.

Pinus ponderosa, Douglas.* (*P. Benthamiana,* Hartweg.)

Yellow Pitch-Pine or Trucker-Pine. North-Western America. Height of tree often to 225 occasionally to 300 feet, with a stem reaching 24 feet in circumference. Growth comparatively quick. Thrives best in deep loamy sand, but grows also on dry rocky ridges [Farlow]. Varies in degree of hardiness according to the locality, in which the seeds were obtained [Prof. Th. Meehan]. The wood is yellowish, hard, strong, heavy and durable; for general purposes it is locally preferred to that of other pines; also largely used in mining operations. There are fine groves of this tree up to 5,000 feet elevation in California, but the variety P. Engelmanni (Parry) ascends to 12,000 feet. The bark contains a considerable quantity of tanning substance. Wood pale and soft, neither knotty nor resinous, much esteemed for cabinet-work [Hoopes]; it is of great strength, and used for floors, joists and much other work in carpentry. Gibbons relates, that the wood, with the bark adherent, exposed to the weather, will decay within a year, but that when stripped and covered with soil it is readily persistent. Dr. Kellogg, who aptly calls this tree herculean, saw logs, which had been in the ground twelve years, quite sound. Sap-wood very thick. This pine has proved well adapted even for rather dry localities in Victoria, but is there slow of growth. P. latifolia (Sargent) is an allied species of Southern Arizona.

Pinus Pseude-Strobus, Lindley.

Mexico, up to 10,000 feet. This pine is superior in appearance to any other Mexican pine; height to about 80 feet.

Pinus pungens, Michaux.

South-Eastern States of North-America. Although seldom over 50 feet high, this pine has the recommendation of being of remarkably quick growth, especially in early life. This species is very resinous, also powerfully and pleasantly odorous [Prof. Buckhout] should prove of great value. Flower-spikes red; cones large early formed [Prof. Meehan].

Pinus Pyrenaica, Lapeyrouse. (*P. Brutia,* Tenore.)

In the countries at the Mediterranean Sea, ascending to 5,000 feet. A pine of quick growth, to 80 feet in height; the wood is pale and dry, almost free from resin, and of considerable value. The tree commences to bear fruits in about a dozen years already.

Pinus reflexa, Engelmann.

California. Allied to P. flexilis, belonging to the Strobus section, but with comparatively large inappendiculated nuts.

Pinus religiosa, Humboldt.

Oyamel-Fir. Mexico, from 4,000 to 11,500 feet above the sea-level, thus reaching the limits of arboreous vegetation. A magnificent tree with somewhat silvery leaves, growing to a height of 150 feet, stem reaching 6 feet in diameter. The wood is particularly well fitted for shingles and laths. This species endures the winters of Middle Europe.

Pinus resinosa, Solander.

Red Pine. North-America, principally Canada and Nova Scotia, but extending to Pennsylvania. It attains a height of 150 feet, the stem a diameter of 3 feet. It is of rapid growth, and on account of the reddish-barked stem ornamental [Sargent]; delights in sandy soil, naturally drained, and on such produces the best quality of timber [Fernow]; the wood is hard, fine-grained, strong, elastic, heavy and durable, to various extent resinous, and used for ship-building and structures of various kinds. A search should be instituted after least odorous essential oils, some of which perhaps yielded by particular pines, to effect the fixing of delicate scents, which could not be isolated by distillation or other methods.

Pinus rigida, Miller.*

American Pitch-Pine. From New England to Virginia. It grows to a height of 80 feet. Timber from gravelly or rocky soil heavy and resinous, from damp alluvial soil light and soft; used for building. But the tree is principally important for its yield of turpentine, resin, pitch and tar. It is suitable for sea-shores; it will also grow in the driest localities, as well as in swamps, nor is it readily susceptible to injury from fire. Prof. Meehan mentions this as the most rapid grower among North-East American pines. With P. Tæda among the most oleous and resinous pines, to be disseminated million-fold in such extensive malarial regions, as cannot be readily or profitably drained, to subdue miasmata by the copious evolution of the double oxyde of hydrogen and ozone. The first trees in Australia were reared by the writer of this work.

Pinus rubra, Lambert.

The Red Spruce. North-Eastern America. Allied to P. alba and P. nigra. Wood reddish-brown.

Pinus Sabineana, Douglas.*

Californian Nut-Pine or White Pine. From California to the Rocky Mountains. Height to 150 feet; stem frequently 5 feet in diameter. Leaves unusually long. The wood is pale and soft; according to Dr. Gibbons it is hard and durable when seasoned, with close and twisted grain, and contains much resin; for fuel, when well-distributed heat is requiste, far surpassing all other Californian woods in value; yields an abundant supply of excellent turpentine, and thence again by distillation a superior oil [Dr. Kellogg]. The clustered heavy cones attain a length of one foot. The seeds are edible; they are produced in great profusion, and constituted formerly a large portion of the winter-food of the native tribes. Proves even in dry localities of Victoria to be of quick growth.

Pinus selenolepis, Parlatore.

Japan, up to elevations of 7,000 feet. This fir rises to a height of about 150 feet. It is known also as Veitch's Fir.

Pinus serotina, Michaux.

Pond-Pine. Southern States of Eastern North-America, in morassy soil, principally near the sea-coast. It gets about 50 feet high. The wood is soft. Of importance as antimalarian for fever-swamps. Regarded by Prof. Meehan as an extreme form of P. rigida.

Pinus Sibirica, Turczaninow. (*P. Pichta,* Fischer.)

Siberian Pitch-Fir. Russia, westward to the Volga, eastward to Kamtschatka, ascending the Altai-mountains to 5,000 feet. This pine reaches a height of about 50 feet.

Pinus silvestris, C. Bauhin.*

Scotch Pine, Foehre, Kiefer. Europe, Northern and Western Asia, reaching to 70° north-latitude, ascending the Alps to 6,000 feet, extending south-eastward to the Black Sea, thriving best in sandy soil. Of all trees the one, which needs the least of mineral aliment from the soil; hence adapted for pure sand, where it forms twice as much humus within the same time as Robinia Pseudacacia or poplars, while its wood is much more valuable. More easily transplanted than any other European species [Wessely]. A ve valuable tree, becoming fully 100 feet high, usually growing to age of about 120 years, but sometimes getting much older; th venerable tree at Schandau, blown down by a storm, showed annual rings. It is important for masts and spars. The

Baltic, Norway- or Riga-deals are obtained from this pine, as well as a large portion of the European pine-tar and pitch. A kind of vanillin is prepared from the cambium-sap of this pine. Its cones have come into use for tanning in France. Proves adapted even for the drier parts of Victoria, but here in the lowlands apt to take blight. Maximum rate of growth in Nebraska, according to Governor Furnas (in Prof. Meehan's *Gardeners' Monthly*), 3 feet stem-circumference at 2 feet from the ground in 10 years. The leaves of pines can be well converted into material for pillows and mattresses, with the great recommendation of healthfulness for such a purpose. All fir-forests are antimiasmatic and salubrious for hectic patients, in consequence of the di-oxyde of hydrogen evolved from their terebinthine emanations. The annual importation of tar and resin from coniferæ into Britain approached recently one million sterling in value, of which P. silvestris must have contributed a large share. Consult also on various coniferous trees Loudon's classic "Arboretum."

Pinus Sitkensis, Bongard.* (*P. Mensiesii,* Douglas.)

North-Western America, extending also to Kamtschatka, Amur and Japan. Has grown in the south of New Zealand to 30 feet in 15 years [Th. Waugh]. Has there done best among the spruces. The Blue Spruce of California, also called Tideland-Spruce, ascending to elevations of 9 000 feet; of rapid growth in congenial soil. A very handsome tree, which furnishes soft, light, pale and fine-grained timber, used largely for piles [Dr. Gibbons]. It thrives best in moist ground. According to Prof. Brewer, instances are on record of trees having attained a height of over 300 feet, and a stem of 7 feet in diameter at 100 feet from the base. From an exceptionally large tree 100,000 shingles were obtained, besides 58 cords of wood.

Pinus Smithiania, Lambert. (*P. Khutrow,* Royle.)

Himalaya-mountains, at elevations frem 6,000 to 11,000 feet, extending to Afghanistan and to China. This spruce, known vernacularly also as Kutro- or Morinda-Spruce, attains a height of 150 feet, and the stem a girth of 21 feet. The wood is pale, even and straight-grained, but only durable under shelter; for inside-work greatly in use. Hardy in Middle Europe.

Pinus Strobus, Linné.*

Weymouth-Pine or American White Pine. North-Eastern America, growing on any soil, but particularly adapted for deep, rich ground in mountain-valleys; known to reach a height of 270 feet, with a stem as much as 8 feet in diameter. It is the principal pine of the lumber-trade of the Eastern States. One of the finest among ornamental conifers. Of comparatively quick growth, but with little tolerance to drought [Hon. N. J. Colman]. The wood is soft, whitish or yellowish, light, free from knots, almost without resin

easy to work, very durable, and much esteemed for masts, bridges, frames of buildings, windows, ceilings, flooring, oars, cabinet-work and organ-pipes, also much used for matches. Indeed, its use is far more diversified than that of any other tree in North-America [Dawson]. The tree yields American turpentine and galipot. Mr. Cecil Clay cut exceptionally 40,000 feet of its timber on an acre of ground in the Virginian mountains. The sap-wood is remarkably thin. The tree endures the climate of Norway to lat. 61° 15' [Prof. Schuebeler]. Maximum-rate of circumferential stem-growth in Nebraska $2\frac{1}{2}$ feet in 12 years [Governor Furnas]. The wood can advantageously be converted into paper-material as an admixture to other substances; in Europe the wood of P. picea and P. Abies is preferentially used for this purpose. See also in reference to this and other N. Amer. Pines, Michaux and Nuttall's Sylva.

Pinus Tæda, Linné.

Frankincense- or Loblolly-Pine. Florida, Carolina and Virginia, westward to Texas, in moist loamy-sandy soil, attaining a height of about 120 feet. Adapted to a wide range of sites; light-needing [Farlow]. The timber is liked for pumps, but liable to warp and decay in buildings on exposure [Sargent]. Stems sought for masts. The tree yields turpentine in good quantity, though of inferior quality, and exudes much resin; it likes regions near the coast; hence can be well utilized for raising fir-forests on shore-lands, especially as this pine takes readily possession of cleared forest-ground, and by quick growth overpowers other young trees [Prof. C. Mohr].

Pinus tenuifolia, Bentham.

Mexico, at an elevation of about 5,000 feet, forming dense forests. Height of this pine to nearly 100 feet; stem to 5 feet in diameter.

Pinus Teocote, Chamisso and Schlechtendal.

Okote- or Torch-Pine. Mexico, from 5,000 to 11,000 feet above the sea-level. Tree often to 150 feet high; stem to 4 feet in diameter. It yields the Brea-turpentine, from which locally resin and oil of turpentine are obtained; the wood is remarkably durable.

Pinus Thunbergii, Parlatore.

Japan. A tall pine with wide ramifications. Closely cognate to P. Massoniana. The most common of all trees in Japan, called there the "Matsu" or "Kouromatsou." It attains a stem-diameter of 6 feet, a height of 100 feet, and reaches an age of several centuries. It prefers sandy soil. Splendid for avenues [Rein]. supplies a resinous, tough and durable wood, used for buildings furniture, but suitable only for indoor-work [Veitch]. The ro when burned with the oil of Brassica orientalis, furnish the Ch lampblack.

Pinus Torreyana, Parry.

California. A small coastal Pine, buffeted by the sea-breeze [Prof. Sereno Watson]. Leaves very stout. An average cone of this pine will contain about 130 seeds, weighing 3 ounces; they are edible [Meehan].

Pinus Tsuga, Antoine.

Northern provinces of Japan, 3,000 to 9,000 feet above the sea. This very hardy spruce-fir grows to a height of over 100 feet. Its timber is durable, tough and dense, used for masts and spars, also for shingles, which will last 30 to 40 years [Matzuno]; highly esteemed for superior furniture, especially by turners. It is of a yellowish-brown colour. P. Araragi (Siebold) is the oldest name for this species, as pointed out by Prof. C. Koch.

Pinus Webbiana, Wallich.

King-Fir, Dye-Fir, Himalaya-mountains, at an elevation of from 7,000 to 13,000 feet, extending to Afghanistan. A splendid fir, reaching a height of 150 feet, the stem a circumference of 30 feet. Will bear a good deal of shade [Dr. Brandis]. The wood is pale, soft, cross-grained and very resinous, on the testimony of Mr. Webb somewhat similar in texture and odour to that of the Bermuda-Cedar. The natives extract a splendid violet dye from the cones. The oldest name for this species is P. spectabilis (D. Don) according to Prof. C. Koch.

Pinus Williamsonii, Newberry.

California and Oregon, up to 12,000 feet. Height of tree reaching 150 feet. Timber very valuable [Vasey]. Many other pines, eastern as well as western, not alluded to on this occasion, are worthy of especial utilitarian inquiries. Pines are the leading trees for imparting that permanent green into landscapes, derivable almost solely from Conifers in cold climes, and all the more appreciated by refined taste for mass-planting with wider scope in zones of evergreen vegetation, where most kinds of trees with deciduous foliage, however eligible for street-planting, are out of their element, and look only for about two months lovely, for two passable, for two unsightly and without winterly surroundings for six months dead, and that during the very time of the most beautiful general verdure.

Piptadenia Cebil, Grisebach. (*Acacia Cebil,* Grisebach.)

La Plata-States. A tree, attaining 60 feet in height, there furnishing a tan-bark of fair strength [Hieronymus].

Piptadenia rigida, Bentham.

Sub-tropical and extra-tropical South-America. This acacia-like tree furnishes the angico-gum, similar to gum arabic. The wood, according to Saldana da Gama, serves for naval constructions.

Pipturus propinquus, Weddell.

Insular India, South-Sea Islands and warmer parts of East-Australia. This bush is higher and rather more hardy than Boehmeria nivea; in fibre it is similar to that plant. P. velutinus (Wedd.) is closely allied. The few other species serve probably as well for fibre.

Pircunia dioica, Moquin. (*Phytolacca dioica,* Linné.)

Southern Brazil and La Plata-States. The Ombu. A deciduous tree for shady avenues, grown in South-Europe as well as in many other mild countries; shown by the writer of this work to be hardy in the lowlands of Victoria. It attains a height of about 60 feet, and is comparatively quick of growth. Apt to be snapped off, when exposed to any gales [Prof. McOwan]. The plant is also of some medicinal value, like the allied Phytolacca decandra (Linné); the use of the berries of the latter for colouring wine is objectionable, as they are deleterious.

Piscidia erythrina, Linné.

West-Indies and Florida. "Jamaica-Dogwood." A tree, reaching a height of about 30 feet. The bark has come into medicinal use, particularly as an hypnotic.

Pisonia aculeata, Linné.

Tropical and sub-tropical countries of both hemispheres, extending as a native plant into New South Wales. This rambling prickly bush can be chosen for hedge-copses.

Pistacia Atlantica, Desfontaines.

North-Africa. As the experienced explorer, Dr. E. Cosson, recommends this tree for raising forests on the high Algerian plateaux, it should also be very acceptable in other similar regions; yields mastic also.

Pistacia Lentiscus, Linné.

The Mastic Tree. Mediterranean regions. A tall evergreen bush, exuding the mastic-resin, mostly through incisions into its bark. In Morocco the plant is extensively used for hedges also.

Pistacia Terebinthus, Linné.

Countries around the Mediterranean Sea, thence to Afghanistan and Baluchistan. A tall bush or small tree with deciduous foliage. The fragrant Cyprian or Chio-turpentine exudes fr[om] stem of this species; it was used already by Hippocrates i[n] nally. Recently it has here been employed with advantage [by] Astles in carcinomatous affections. In Upper India the see[d] pressed for oil [Brigade-Surgeon Aitchison].

Pistacia vera, Linné.*

Syria, Persia, Afghanistan. A deciduous tree, sometimes to 30 feet high, yielding the Pistacio-nuts of commerce, remarkable for their green almond-tasted kernels. The galls from this tree are of technic value. Dr. Bancroft adopted the ingenious plan of inserting Pistacia-seeds into dry figs, to secure their power of germination during transmission to remote places. Artificial pollination increases the fecundity. Can be grafted on P. Terebinthus [Parlatore, Dyer].

Pisum arvense, Linné.

Eastern countries at the Mediterranean Sea. A good forage-plant, though annual; thriving in any soil; best cut for stable-fodder [Naudin]. Hardier and more drought-resisting than the ordinary pea, of which it may nevertheless be the origin [A. de Candolle]. Alefeld, Koernicke and Wittmack, as leading scientific agronomists, regard P. sativum as a garden-variety of this plant.

Pisum sativum, Linné.*

The common Pea. South-Western Asia. Cultivated already by the ancient Greeks and Trojans [Virchow, Wittmack], during the stone-age in Hungary [A. de Candolle]. Matures under horticultural care seeds even in the hot desert-regions of Central Australia [Rev. H. Kempe], where it is a winter-plant like in tropical regions; on the other hand it comes to perfection as far north as 70° 22′ in Norway [Schuebeler]. This annual of daily use could hardly be left unnoticed on this occasion. Suffice it to say, that the herbage as a nutritious fodder deserves more attention, than it receives. The green fruit contains inosit-sugar and cholestrin-fat. For field-culture a sandy-calcareous loam should be chosen for this plant, to ensure rich and safe harvests. Peas retained their vitality after four years' exposure to the extreme frosts of Polaris-Bay. P. Aucheri (Jaubert and Spach), which is perennial, occurs in alpine elevations on the Taurus.

Pittosporum tenuifolium, Banks and Solander.

New Zealand. This with P. eugenioides (Cunningham) has proved very suitable for tall garden-hedges, for which these and several other species were first brought into notice by the writer. Unhurt by a cold of 9° F. [Gorlie]. Hardy at Campbelltown, Argyleshire. P. Ralphii (Kirk), also from New Zealand, endures the winters of Arran. Seeds of any Pittosporum hardly ever fail to germinate.

Pittosporum undulatum, Ventenat.

South-Eastern Australia. This tree with P. bicolor (Hooker) produces a wood well adapted for turners' purposes; to some extent it serves also as a substitute for boxwood. The flowers furnish a

highly fragrant volatile oil on distillation. The tree under very favorable circumstances attains a height of 80 feet; it is largely pervaded by a bitter peculiar principle, which occurs also in other species.

Planera aquatica, Gmelin.

South-Eastern States of North-America. An elm-like tree, which can be chosen for plantations in wet localities. The wood is hard and strong.

Plantago lanceolata. Linné.

Europe, Western Asia, Northern Africa. The Rib-herb or Plantain-herb. This perennial weed gets disseminated readily, and is recommended by some ruralists, though neither by Langethal nor Morton, as valuable on very poor pasture-land. The allied P. media (L.) is of similar use, and so perhaps P. major (Camerarius), all of equal geographic range; the seeds are much liked by cage-birds.

Plantago Psyllium, Linné.

Countries around the Mediterranean Sea, extending to Austria and Persia. An annual herb. The seeds render water very mucilaginous, and come thus into requisition for the preparation of silk-ware, for imparting gloss to coloured paper and for cotton-printing, irrespective of some medicinal utility [Wiesner]. The same may be said of P. cynops (Linné) and P. arenaria (Waldstein and Kitaibel). These species could be easily naturalised on sandy coast-land.

Platanus occidentalis, Catesbye.*

The true Plane-Tree of Eastern North-America; also known as Buttonwood. More eligible as an avenue-tree than as a timber-tree. Height reaching about 100 feet; diameter of stem at times to 14 feet. Wood dull-red, light, not readily attacked by insects; used in the manufacture of pianofortes and harps; cuts into very good screws, also presses, dairy-utensils, windlasses, wheels and blocks. The young wood is silky-whitish and often handsomely mottled [Robb]. The tree likes alluvial river-banks, and has been successfully planted in morassy places, absorbing miasmatic effluvia.

Platanus orientalis, Linné.*

The genuine Plane-Tree, extending from South-Europe to Middle Asia. Hardy in Norway to lat. 58° 8′ [Schuebeler]. One of the grandest trees for lining roads and for street-planting, deciduous like most other planes, rather quick of growth. Attains a heigh of 90 feet and a stem-circumference of occasionally 70 feet, reachin an age of over 800 years. It resists the smoke in large towns, su as London, better than any other tree, growing vigorously e under such disadvantage. The wood is well adapted for fur

and other kinds of cabinet-work. Propagation from seeds or cuttings. Growth in height at Port Phillip 30-40 feet in 20 years. An evergreen plane was mentioned already by Plinius as occurring in Candia [Sir J. Hooker], and has lately been re-discovered.

Platanus racemosa, Nuttall.

The Californian Plane-Tree. A good promenade-tree, which according to Prof. Bolander grows more rapidly and more compact than P. occidentalis. Wood harder and therefore more durable, also less liable to warp. According to Dr. Gibbons, the tree attains a height of about 100 feet and a stem-diameter of 8 feet. The wood is brittle; in use however by turners.

Plectocomia Himalaiana, Griffiths.

Sikkim, up to 7,000 feet, extending to 27° north latitude. This Rattan-Palm requires moist forest-land. Its canes are not durable; but the plant is an object worthy of scenic horticulture, and would prove the hardiest among its cogeners. P. elongata (Blume) ascends, according to Drude, to 4,500 feet.

Plectocomia macrostachya, Kurz.

Tenasserim, at about 3,000 feet elevation, therefore most likely hardy in temperate lowlands.

Plectranthus Madagascariensis, Bentham.

Madagascar. This herb produces nutritious tubers [Mingard and Daruty].

Plectronia ventosa, Linné.

South-Africa. A hedge-bush, like P. ciliata (Sonder) and P. spinosa (Klotzsch).

Plumiera acutifolia, Poiret.

Tropical America. A small, thick-branched tree, hardy at some distance beyond the tropics. It is of such easy cultivation, that it may become important, like many other as yet neglected apocynaceous plants, for the scent of its large and copious flowers.

Poa Abyssinica, Jacquin. (*Eragrostis Abyssinica,* Link.)

The Teff of Abyssinia, Nubia, Egypt, and nearest lands. The grain of this annual grass there extensively used for bread of an agreeable acidulous taste. According to Prof. Schweinfurth the P. Aegyptiaca, Willdenow (E. Aegyptiaca, Delile) is identical.

Poa airoides, Koeler. (*Catabrosa aquatica,* Beauvois.)

The Water Whorl-grass. Europe, North-Africa, Northern and Middle Asia, North-America. A creeping grass, suitable for pastures subject to inundation; hence fit also for irrigation.

Poa alpina, Linné.

Alpine and Arctic Europe, Asia and North-America. Deserves to be transferred to other higher mountains as a nutritious perennial pasture-grass. P. sudetica (Haenke) and P. hybrida (Gaudin) are mentioned also as excellent alpine grasses.

Poa aquatica, Linné. (*Glyceria aquatica,* Smith.)

Europe, Northern and Middle Asia, North-America. This conspicuous water-grass attains a height of about 6 feet. It is perennial, and deserves naturalisation in our swamps. It produces a large bulk of foliage, and may be disseminated for fodder-purposes. On the testimony of Dr. Curl, this is one of the best feeding grasses in New Zealand.

Poa arachnifera, Torrey.*

The Texas Blue Grass Prairies of Louisiana and Texas Perennial, with creeping roots. It spreads rapidly, surpasses in size the Kentucky Blue Grass (Poa pratensis), and is known to have grown 10 inches in ten days. Stock of all kinds have a predilection for it. The winters of Texas do not even nip it, but it dies down during summer; it is never quite tramped out [G. Hogan]. It bears heavy pasturing, and can also be utilised for lawns and as a forest-grass [S. Tally]. For permanent pasture, this promises to be one of the very best grasses yet brought to the attention of the Southern States [Dr. Vasey].

Poa Bergii, Hieronymus.

La Plata-States. Supplies excellent fodder there, with some species of the section Eragrostis.

Poa Billardieri, Steudel.

Extra-tropical Australia. A perennial rigid grass, of some value for saline meadows.

Poa Brownii, Kunth* (*Eragrostis Brownii,* Nees.)

Tropical and Eastern extra-tropical Australia, according to Duthie also in India. It is here mentioned as a valuable perennial species, keeping beautifully green in the driest Australian summer, even on poor soil; indeed the missionary Pastor Kempe pronounces it to be the best of all grasses on the Central-Australian pastures. The section Eragrostis of the genus Poa contains numerous speci in the hotter parts of the globe. Of these, many would doubtl be hardy far beyond the tropics, and prove of value on past land

Poa bulbosa, Linné.

Europe, North-Africa, extra-tropic Asia. A perennial species. Dr. J. Aitchison singles it out for laudation as a profuse pasture- and hay-grass in Afghanistan. Closely allied to it is P. alpina, L.

Poa cæspitosa, G. Forster.

Extra-tropical Australia and New Zealand, ascending alpine elevations. A tufty grass, available throughout the year for pasture-feed, when young or when offering flowering or seeding-stalks, or when presenting tender varieties; the rougher varieties utilised by the aborigines for nets and cordage. Resisting drought. Well worthy of being naturalised in other parts of the globe. Refer for further information on this and other N.Z. grasses to J. Buchanan's special work, in which P. anceps (Forster) is also mentioned as important.

Poa Canadensis, Beauvois.

The Rattlesnake-grass of South-Eastern America. A valuable swamp-grass.

Poa Chinensis, Koenig.

Southern and Eastern Asia, East-Australia. Recommended by Mr. F. M. Bailey as a valuable pasture-grass, perhaps on account of its tender panicles. P. compressa (L.), of Europe and Western Asia, will grow in pure sand.

Poa Colensoi, J. Hooker.

New Zealand, up to 5000 feet. This tufty grass is greedily devoured by sheep, which thrive well on it. Holds its ground well, being of great vitality [D. Petrie].

Poa cynosuroides, Retzius.

North-Eastern Africa, Southern Asia. A harsh perennial grass, not serviceable for fodder, but mentioned by Royle as a fibre-plant of North-Western India, where it is valued as material for ropes. Mr. Duthie has it however among his illustrations of the fodder-grasses of N.W. India.

Poa digitata, R. Brown.

South-Eastern and Central Australia. Valuable for fixing wet river-banks and slopes. It forms large stools. Cattle and horses relish the young shoots.

Poa distans, Linné.

Europe, North-Africa, Middle and Northern Asia, North-America Perennial. It is one of the limited number of tender grasses suited for moist saline soil, and thus affords pasturage on coast-marshes.

Poa fluitans, Scopoli. (*Glyceria fluitans,* R. Brown.)

The Manna-grass. Europe, North-Africa, Middle and Northern Asia, North-America, East-Australia. Perennial. Excellent for stagnant water and slow-flowing streams. The foliage is tender. The seeds are sweet and palatable, and in many countries are used for porridge. This grass is indigenous in Norway northward to lat. 69° 9′ [Schuebeler.]

Poa foliosa, J. Hooker.

Auckland- and Campbell-Island, as well as Southern New Zealand, reaching almost to the glacier-region. Perennial, forming large mounds. Prof. Kirk calls its a noble species, producing an immense yield of foliage. Mr. Buchanan also speaks of the fattening food, afforded to horses and cattle by this grass. Blade of leaves broad; panicle soft and ample. Horses have a great partiality for it. Unlike most other grasses it readily adapts itself to peaty or newly drained soil, and is in this respect unsurpassed.

Poa Forsteri, Steudel. (*Dactylis cæspitosa,* Forster.)

The Tussock-grass, Fuegia, Falkland-Islands, South-Patagonia. Introduced by Sir Joseph Hooker into the Hebrides, and by Mr. Traill into the Orkney-Islands. Extending to the island South-Georgia, 54° S. [Dr. Wild]. Delights, according to Mr. Ingram, in deep, boggy and mossy land, even when exposed to sea-spray. Cultivated plants might be dressed with some salt. Thrives in cold countries near the sea in pure sand, at the edge of peat-bogs. It would probably prosper on alpine moors. It is perennial, and reaches a height of 9 feet. It is very nutritious, and much sought by herds. The base of the stem is nutty and edible. An allied species is P. Cookii (J. Hooker), from Kerguelen's Island.

Poa maritima, Hudson.

Europe, North-Africa, Northern-Asia, North-America. Roots long and creeping. This grass can also be depastured and grown on brackish meadows.

Poa nemoralis, Linné.

Europe, Northern and Middle Asia, North-America. This perennial grass can be raised on shady forest-land, as the name implies; but it accommodates itself also to open places, and will grow even among dry rocks. It endures alpine winters. According to Lawson, no better grass exists for displacing weeds on pleasure-lawns; the same may be said of Poa compressa (L.).

Poa nervata, Willdenow.

Southern States of North-America. Called in Alabama the Manna-grass. Perennial. Valuable for pastures in low for land [C. Mohr].

Poa palustris, Linné. (*Poa serotina,* Ehrhart.)

Europe, Northern Asia, North-America. A perennial grass, allied to P. nemoralis, excellent for moist meadows and river-banks, it will even prosper on saline ground. Its foliage is tender, tasty and nourishing. In mixtures of grasses it keeps up the growth until late into the autumn. P. fertilis (Host) is a mere variety of this species.

Poa pectinacea, Michaux. (*Eragrostis pectinacea,* Gray.)

Middle and Southern States of North-America. This perennial grass spreads rapidly over dry ground and even coast-sands. C. Mohr regards it as valuable for pastures, and mentions as such also Eragrostis nitida (Chapman) and E. tenuis (Gray).

Poa pratensis, Linné.*

The ordinary English Meadow-grass. Widely distributed as indigenous through the extra-tropic regions of the northern hemisphere, in Greenland to 81° N. A perennial species, with creeping roots, fit for any even very dry meadows, thriving early, and able to live also in alpine localities. Better adapted for pasture than hay. It is suitable for moor-land, when such is laid dry; although it flowers only once during the season, it offers a nutritious fodder, even on comparatively poor soil; it resists drought, forms an excellent sward, and can be used with advantage for intermixing with other pasture-grasses. Foliage particularly tender. In the United States it is known as the Kentucky Blue Grass or Pennsylvania Green Grass, and is considered one of the best for lawns by Professor Meehan, as it will crowd out all weeds in time.

Poa trivialis, Linné.*

Europe, North-Africa, Middle and Northern Asia. Also a good perennial grass for mixture on pasture-land. One of the best grasses for sowing on ground recently laid dry. Recommendable also as a lawn-grass. Sinclair regarded the produce of this Poa as superior to many other kinds, and noticed the marked partiality, which horses, oxen and sheep evince towards it. To thrive well, it wants rather moist and rich soil and sheltered places. It is a later grass than P. pratensis, well adapted for hay, and gives good after-growth [Langethal]. Well suited for irrigation-culture.

These few species of Poa have been singled out as recommendable, because they are well tested. Future experiments beyond Europe will add others to lists of recommendations like this.

Podachænium alatum, Bentham. (*Ferdinanda eminens,* Lagasca.)

Central America, up to a height of about 8,000 feet. A tall shrub; on account of the grandeur of its foliage in requisition for scenic effects.

Podophyllum peltatum, Linné.*

Eastern North-America, where it is known as the Mandrake. Hardy in Christiania. A perennial forest-herb of importance for medicinal purposes. The root contains the bitter resinous podophyllin. American physicians recommend it as a drastic purgative, cholagogue and hepatic stimulant. Podophyllum Emodi (Wallich), occurring in the Indian mountains at heights of from 6,000 to 14,000 feet, can probably be used like the American species. The berries of both are edible, though the root and leaves are poisonous. A third species, P. pleianthum, has been described by Dr. Hance, from Formosa.

Pogostemon Patchouli, Pelletier.

Mountains of India. A perennial herb, famed for its powerful scent, arising from a volatile oil. P. parviflorus and P. Heyneanus (Bentham) belong to this species. One cwt. of the herb yields about 28 ounces oil [Piesse]; but the essence is chiefly obtained by enfleurage.

Polianthes tuberosa, Linné.

Mexico. The Tuberose. Valuable for perfume. Available late in the season; thus one of the plants most required, to maintain garden-fragrance in serene climes through the course of the year. The gathering of flowers of "Tubereuses" at Grasse, Cannes and adjacent villages alone comes annually to about 20,000 lbs. [Piesse]. The price is about 1s. per lb. [Daruty]. The scent is best extracted by Blogg's methyl-process, mentioned under Jasminum grandiflorum. The double-flowering state of this plant preferable for distillation.

Polygala crotalarioides, Hamilton.

Temperate Himalaya and Khasia. Praised as an ophidian alexipharmic. To several other species both of the eastern and western hemisphere similar properties are ascribed; but we are almost entirely without any reliable medical testimony on these and many other supposed vegetable antidotes against snake-poison. Doubtless this small perennial herb possesses therapeutic virtues like many of its congeners.

Polygala Senega, Linné.

The Senega Snake-Root. Eastern North-America. A perennial herb. The root is of medicinal value, and about 100,000 lbs. of it are required annually.

Polygaster Sampadarius, Fries.

South-Eastern Asia. One of the most palatable of all truff

Polygonum tinctorium, Loureiro.

China and Japan. An annual herb, deserving attention and local trials, as yielding a kind of indigo; one of the most important dye-plants of Japan. It can be cultivated in cold climes, being hardy still at Christiania. Likes marshy land [Vilmorin]. Its growth would be vigorous. Various Polygonums contain tannin, P. amphibium (Linné) as much as 11½ per cent. [Masters.]

Polyporus giganteus, Fries.

Europe. Dr. Goeppert records this and also the following species as allowed to be sold for food in Silesia: P. frondosus, Fr., P. ovinus, Fr., P. tuberaster, Fr., P. citrinus, Pers. Dr. Atkinson mentions as edible among the fungs of Cashmere P. squamosus (Fries). Bergner and Frog illustrate P. confluens (Fries) among the esculent fungs of Switzerland; near relatives of all these occur in Australia also. The P. portentosus (Berkeley) of Australia has been recommended as material for trusses and for other articles requiring lightness and some elasticity; the almost cosmopolitan P. iginarius (Fries) may perhaps serve similar purposes and as Solah-pith.

Populus alba, Dodoens.

The Abele or white Poplar, indigenous to South-Eastern Europe, North-Africa and Northern and Middle Asia, extending to North-China. growing on the Himalayas up to 10,000 feet, ceasing at 4,000 feet. In Norway it is hardy to lat. 67° 56′ [Prof. Schuebeler]. Height reaching 90 feet. Emits suckers. It has proved an excellent avenue-tree, even in comparatively waterless situations, and the partial whiteness of its foliage gives a pleasing effect in any plantation. Indicates to some extent the state of the weather, as known already to the Ancients [Fraas]. A Silver-Poplar at Slowitz attained a basal stem-diameter of 20 feet, indicating according to Pannewitz an age of probably 400 years. The wood is pale. with a reddish tinge, brown near the centre, soft and light. It can be used for flooring; it is particularly sought for trays, bowls. bellows and shoe-soles; also, according to Porcher, for wooden structures under water. "Sparterie" for plaiting is obtained from the wood-shavings. The wood of this and some other poplars is easily converted into paper-pulp, which is cheaply bleached. Lines of poplars along forest-streams prevent or impede the progress of wood-conflagrations. The roots of poplars spread widely. P. canescens (Smith), the Grey Poplar, is either a variety of the Abele or its hybrid with the Aspen, and yields a better timber for carpenters and millwrights.

Populus angulata, Aiton.

Eastern North-America. The "Water-Poplar" or Carolina-Poplar. Acquires a height of about 70 feet; branches very spreading; hence this species well adapted as a promenade-tree.

Populus balsamifera, Linné.

The Tacamahac- or Balsam-Poplar of the colder, but not the coldest parts of North-America; also in Siberia and on the Himalayan Mountains, where it ranges from 8,000 to 14,000 feet, called by Dr. Kellogg "the balmiest of all trees." It will endure the winters of Norway to lat 69° 40′ [Schnebeler]. It attains a height of 80 feet. The tree may be lopped for cattle-fodder [Stewart and Brandis]. Prof. Meehan says, that it will grow near the ocean's brink. Its variety is P. candicans (Aiton), acknowledged as a distinct species by Wesmael.

Populus Canadensis, Moench. (*P. monilifera,* Aiton.)

The Cottonwood-tree of North-America, extending to New Mexico. Height to 150 feet; stem to 8 feet in diameter. Not of longevity; needs full light; adapted to a variety of soils, but preferring such as is strong and humid [B. E. Fernow]. One of the best poplars for the production of timber, which is soft, light, very easy to work, suited for carving and turnery; it is durable if kept dry, and does not readily take fire; nevertheless it supplies a fair fuel. The wooden polishing-wheels of glass-grinders are made of horizontal sections of the whole stem, about one inch thick, as from its softness the wood readily imbibes the polishing material. It is useful for rails and boards, and has also come extensively into use for paper-pulp. Judge Whitning says, that it has no rival in quickness of growth among deciduous trees. Governor Furnas found the stem-girth in Nebraska reaching to 93 inches in eleven years at 2 feet above ground. Recommended by Wessely, together with P. alba and P. nigra, for fixing drift-sand, on which these poplars never become suffocated. It is advisable, to obtain cuttings from male trees only, for planting along streets or near dwellings, as the minute downy seeds of the female trees are copiously wafted through the air, and may have irritant effects on the respiratory organs of the frequenting people. P. angustifolia (James) is regarded by Wesmael as a mere variety of this species.

Populus ciliata, Wallich.

Himalaya, from 4,000 to 10,000 feet. Height as much as 70 feet, with a straight trunk, which attains 10 feet in girth.

Populus Euphratica, Olivier.

From Algeria dispersed to the Himalayas and Songaria, up to 13,500 feet. Height to 50 feet. Dr. J. Aitchison measured exceptionally big trees, their stems showing at 6 feet from the ground a circumference of 9½ feet. Wood harder than that of most poplars, the inner wood turning blackish in old trees. It used for planking and boat-building [Stewart and Brandis], a for beams, rafters, boxes, paneling, turnery, but particularly account of its lightness for rafts. Cattle will browse on the le

This is the Willow of the 137th Psalm [C. Koch].

Populus Fremontii, S. Watson.

California and adjoining States, on river-banks. Tree, attaining about 150 feet in height and $4\frac{1}{2}$ feet in stem-diameter; leaves large. Much lauded for shading road-sides and promenades, for which however the staminate trees should only be selected. Wood less white than that of P. tremuloides, excellent for dry goods, fruit-butter- and salt-boxes, trays, bowls and other articles; outer bark a fair substitute for cork. The foliage brightens splendidly in autumn. Wood convertible into paper-pulp. [Dr. Kellogg].

Populus grandidentata, Michaux.

The Soft Aspen. Eastern North-America. To 80 feet high. Wood whitish, soft, very light; can be ground into pulp for paper. The oldest name seems P. deltoides, Marsh.

Populus heterophylla, Linné.

The Downy Poplar of North-America, passing also by the name of Cottonwood. Height often 60 feet. The wood is very pale, soft and fissile. All poplars, like willows, are very important to eliminate miasma by absorbing humidity to an enormous extent from stagnant swampy localities; they are likewise good scavengers of back-yards.

Populus nigra, C. Bauhin.

The European Black Poplar, extending spontaneously to China; in the Himalayas up to 12,500 feet. With P. Canadensis and P. balsamifera very fitted for smoky places in manufacturing towns [J. Udale]; the spreading variety is one of the best of trees for lining roads. This species includes P. dilatata (Aiton), and as a contracted variety P. fastigiata (Desfontaines), the Lombardy-Poplar. Among trees the latter is one of the most eligible to plant near houses for serving as a lightning conductor. Greatest height 150 feet. Growth rapid, like that of all other poplars, or even more so. At Bensberg a Black Poplar formed in 80 years a stem 19 feet in circumference; at Wippach a hollow stem showed a girth of 48 feet. In warm zones the growth is still more rapid than in Middle Europe, as is the case with the majority of trees. Northward hardy to Christiania. Wood soft, light and of loose texture, used for joiners', coopers' and turners' work; also for matches; in Upper India for light boxes to serve in the transit of fruits; furnishing furthermore superior charcoal for gunpowder. Bark employed in tanning, producing a fragrant leather; it is however not rich in tannic acid. The tree requires damp soil. It retains its foliage longer than most poplars through the season. Already Hippocrates used it medicinally.

Populus tremula, C. Bauhin.

The Aspen. Europe, North-Africa, Northern Asia to Japan. Height reaching to about 100 feet, stem-circumference to about 12 feet; age 200 years or more. Emits suckers; content with sandy

soil, if not too dry. The aspen is very hardy; at lat. 70° in Norway a tree still attained a height of 60 feet [Schuebeler]. The aspen-wood is whitish and tender, and in use by coopers and joiners. Like the wood of other poplars much sought for paper-mills as an admixture to the pulp. In Japan it is used for engraving rough works and posters. In Sweden largely employed for matches. A variety of this tree with pendent branches occurs.

Populus tremuloides, Michaux.

The North-American Aspen. Ascends to alpine elevations of about 10,000 feet; easily disseminated. Height to as much as 50 feet. The wood is whitish, soft, readily worked, and can be converted into paper-pulp; also of this a weeping variety occurs; the tree extends westward to California. All poplars might be planted in gullies like willows, to intercept forest-fires; also generally on river-banks. They are also valuable honey-yielders [Prof. Cook]. All can easily be propagated from cuttings, and are of quick growth.

Populus trichocarpa, Torrey and Gray.

From British Columbia to California. One of the "Cottonwood-trees." The stem attains a diameter of 5 feet, and is used by the autochthones for canoes [Dr. G. Dawson].

Porphyra vulgaris, Agardh.

Temperate and cold oceans. This largely cosmopolitan seaweed is mentioned here, because in Japan it undergoes regular cultivation. For this purpose branches of Quercus serrata are placed in shallow bays, where Porphyra occurs, during spring, and the crop is obtained from October to March, the seaweed being consumed in its young state. It grows best where fresh water enters the sea. Porphyra contains about 26 per cent. of nitrogenous substances and about 5 per cent. of phosphate of potash. In Japan, according to the catalogue of the International Exhibitions of Sydney and Melbourne, the following Algæ are also consumed for food: Gloiopeltis intricata, G. capillaris, Laminaria saccharifera, two species of Phylloderma, Phyllitis debilis, Kallhymenia dentata, Capea elongata, Alaria pinnatifolia, Gracilaria lichenoides, G. confervoides, Enteromorpha compressa, species of Cystoseira and Halochloa, Codium tomentosum, Mesogloia decipiens and Gelidium corneum.

Portulacaria Afra, Jaquin.

South-Africa. A shrub, rising to 12 feet, called "Spekboom." Affords locally the principal food for elephants; excellent als sheep-pasture, according to Professor McOwan; hence this s lent shrub may deserve naturalisation on stony ridges and in desert-land, not readily otherwise utilised. Would likely acceptable to camels also.

Pouzolzia tuberosa, Wight.

India. The turnip-shaped root of this herb is edible. The plant may prove hardy in extra-tropic frostless regions, and its root may improve in culture.

Prangos pabularia, Lindley.

Plateaux of Afghanistan, Mongolia and Thibet. A perennial fodder-herb, much relished by sheep, eligible for cold and arid localities, and deserving naturalisation on alpine pasture-grounds. Other perennial species exist near the Mediterranean Sea, on the Atlas, the Caucasus and the Indian highlands. P. pabularia is regarded by some as the Silphium of Arrianus.

Prestoa pubigera, J. Hooker. (*Hyospathe pubigera,* Grisebach.)

Trinidad. At an elevation of about 3,000 feet [Krueger]. The stem of this plant attains only about 12 feet in height. Valuable among the dwarf palms, now so much sought for table- and window-decoration.

Pringlea antiscorbutica, W. Anderson and R. Brown.

The Cabbage or Horse-radish of Kerguelen's Island. Also on Possession-Island of the Crozets, on Prince Edward Group and Heard-Island. The perennial long roots taste somewhat like horse-radish. The leaves in never-ceasing growth are crowded cabbage-like into heads, beneath which the annual flower-stalks arise. The plant ascends mountains in its desolate native islands to the height of 1,400 feet, but luxuriates most on the sea-border. To arctic and other antarctic countries it would be a boon. Probably it would live on our Alps. Whalers might bring us the roots and seeds of this remarkable plant, which seems never to have entered into culture yet. The plant was used as cabbage by the celebrated Captain Cook and all subsequent navigators, touching at yonder remote spot, and it proved to possess powerful properties against scurvy. Sir Joseph Hooker observes, that Pringlea can sectionally be referred to Cochlearia. The whole plant is rich in a pungent volatile oil. Through culture important new culinary varieties may probably be raised from this plant. This vegetable in its natural growth tastes like mustard and cress; but when boiled it proved a wholesome and agreeable substitute for the ordinary cabbage.

Pritchardia Gaudichaudi, H. Wendland.

Lowlands of Hawaia. Stem to 20 feet high, stout. Leaves large. Fruit small.

Pritchardia Martii, H. Wendland.

Hawaia. A rather dwarf palm, but with comparatively large fruits, perhaps hardier than P. pacifica (Seemann) of the more equatorial parts of Polynesia.

Pritchardia Thurstoni, F. v. Mueller and Drude.

Fiji. This palm as occurring only in elevations of about 5,000 feet should prove hardier than most palms of the islands in the Pacific Ocean.

Priva lævis, Jussieu.

Chili, Argentina. A perennial herb, the small tubers of which can be used for food [Philippi].

Prosopis alba, Grisebach.

La Plata-States. A tree, rising finally to about 40 feet, with a stem-diameter to 3 feet. The fruit, known as Algaroba blanca, is considered wholesome and nutritious. The tree yields also tan-bark. P. nigra (Hieronymus) serves in Argentina similar purposes.

Prosopis dulcis, Kunth.

From California and Texas to the southern parts of the La Plata-States. Vernacularly known as the Cashaw-, Mesquite- or Algaroba-tree. A thorny shrub, growing finally to a tree of 60 feet height, with a stem $2\frac{1}{2}$ feet in diameter; adapted for live fences. Thrives in damp saltish air and at sea-level [J. W. Dutton]. The wood is durable and of extraordinary strength and excessive hardness, fit for select furniture particularly, assuming when polished the appearance of mahogany. Drawn into use also for knees of boats locally. This is one of the species yielding the sweetish Algaroba-pods for cattle-fodder, and utilised even in some instances for human food. The pods of the various kinds of Prosopis are adapted only for such animals as chew the cud, and thus get rid of distending gases [R. Russell]. Argentina Algaroba-pods contain, according to Sievert, 25 to 28 per cent. of grape-sugar, 11 to 17 per cent. starch, 7 to 11 per cent. protein, 14 to 24 per cent. of organic acids, pectin and other non-nitrogenous nutritive substances. They are also comparatively rich in potash, lime and phosphoric acid. A sparkling drink called Aloja is made of the fruits. This and some allied species yield the Algarobylla-bark for tanning; the leaves contain, according to Sievert, 21 per cent. tannin. The pods also of several species are rich in tannic acid. Mere varieties, according to Bentham, are: P. horrida, P. juliflora, P. siliquastrum, P. glandulosa. Particularly the latter variety exudes a gum not unlike gum-arabic, and this is obtained at times so copiously, that children could earn two or three dollars a day in Texas, while gathering it, latterly about 40,000 lbs. being bought by druggists there. A short communication on the American Algaroba-trees was presented to the Parliament of Victoria by the writer in 1871. Pods of some Prosopis, used as fodder, have caused the death of horses in Jamaica

by overfeeding. P. julifera has not found favor in India. In some places these kinds of plants are subjects to the attacks of boring insects.

Prosopis pubescens, Bentham.

The Tornillo or Screw-bean. Texas, California, Mexico. The pods ripen at all seasons and contain much saccharine nutritive substance [J. S. Gamble]. Likely available for hedges with other species of other countries. Seeds can be converted into food [Sargent]. Not resisting climatic vicissitudes so well as P. dulcis.

Prosopis spicigera, Linné.

India, extending to Persia. A thorny tree, also producing edible pods and enduring some frost. It attains a height of 60 feet, but is of slow growth [Brandis]. Serves for hedge-lines. It can be chosen for desert-land [Kurz].

Prosopis Stephaniana, Kunth.

Syria, Persia, Afghanistan. A shrubby species of hedge-growth. Galls, common on the pods, are collected for dye- and tan-purposes [Dr. Aitchison].

Prostanthera lasiantha, Labillardière.

South-Eastern Australia and Tasmania. Confined to the banks of forest-streams. The only one among more than 2,500 Labiatæ, which becomes a good-sized tree, reaching a height of fully 60 feet. Wood useful for many technologic purposes. The leaves of this and its many congeners afford, on distillation, aromatic oils. Most of the species of this Australian genus are pleasantly and strongly odorous; among them particularly so the tall, shrubby P. rotundifolia (R. Brown), P. melissifolia (F. v. M.), P. cuneata (Bentham), the latter hardy alpine, so that an aromatic oil can be distilled payably from them. These plants should prove valuable on Apiary-grounds also.

Protea mellifera, Thunberg.

South-Africa. This tall bush is deserving a place among the plants of this work, not only in view of its gaudy ornamental aspect, but also on account of the richdom of honey-nectar in its large inflorescence.

Prunus Americana, Marshall. (*P. nigra,* Aiton.)

Canada, Eastern United States of America. A thorny tree, furnishing the Yellow and Red Plum of North-America. Hardy in Norway northward to lat. 65° [Schuebeler]. The fruit is roundish and rather small, but of pleasant taste. All kinds of Prunus are important to the apiary.

Prunus Amygdalus, J. Hooker.* (*Amygdalus communis,* Linné.)

The Almond-tree. Countries around the Mediterranean Sea and South-Western Asia; really indigenous on the Anti-Lebanon, in Kurdestan, Turkestan and perhaps on the Caucasus [Stewart]. Both the sweet and bitter almond are derived from this species. The cost of gathering the crop in South-Europe is about 20 per cent. of its market-value. Their uses and the value of the highly palatable oil, obtained by pressure from them, are well known. This oil can well be chosen as a means of providing a pleasant substitute for milk during sea-voyages, by mixing with it, when required, half its weight of powdered gum-arabic, and adding then successively, while quickly agitating in a stone-mortar, about double the quantity of water; thus a palatable and wholesome sort of cream for tea or coffee is obtained at any moment. Baked remnants of Almonds, left after they have been used at the oil-mill afford one of the best kinds of food for diabetic sufferers. There exist hard- and soft-shelled varieties of both the sweet and bitter almond. The Almond-tree is subject to two fungus-diseases, caused by Cercospora circumscissa and Sporidesmium Amygdalearum [Frank]. Almonds can even be grown on sea-shores. The tree bears still the climate of Christiania in Norway [Professor Schuebeler], and it has been successfully reared by the Moravian missionaries in the most arid regions of Central Australia, but it does not thrive so well there as the Peach-tree. The crystalline amygdalin can best be prepared from bitter almonds, through removing the oil by pressure, then subjecting them to distillation with alcohol, and finally precipitating with ether. The volatile bitter almond-oil—a very dangerous liquid—is obtained by aqueous distillation. Dissolved in alcohol it forms the essence of almonds. This can also be prepared from peach-kernels. The almond-tree is one of the aptest, to be chosen as a standard of comparison with other kinds of trees (as well as other plants) for records of synchronous flowering time. The flower affords to bees, early in the season, nectar and pollen. With the European Walnut-tree and the Olive-tree cultivated on a vast commercial scale at Santa-Barbara by Captain Ellwood Cooper, the President of the State-board for horticulture in California. Import of almonds into Victoria during 1887, 140,591 lbs., valued at £5,942. Britain imported 130,000 cwt. valued at £412,000, in 1889.

Prunus Armeniaca, Linné.* (*Armeniaca vulgaris,* Lamarck.)

The Apricot-tree. China, as already indicated by Roxburgh, not indigenous in Armenia. Cultivated up to 10,000 feet in the Himalayas. Professor C. Koch points to the alliance of this tree to P. Sibirica (Linné), and he considers P. dasycarpa (Ehrhart) to be hybrid between the apricot- and plum-tree. A variety of ap occurs with a sweet kernel. Cold-pressed apricot-seeds yield much like that of almonds. Muspratt found as much as 2 cent. tannin in the bark. The Chinese P. Mume (Sieb. and Z

is a peculiar apricot-tree. Dried apricots and peaches (the stone removed) have become an article of extensive trade, particularly so in Upper India. In 1887 there were 175,500 cases of Apricots sent from California, also 3 million pounds of the evaporated fruit [Journal Society of Arts]. Apricots, Peaches, Plums and Cherries can additionally be preserved as syrupid fruit by heating for ¼ or ½ an hour in a water-bath the fresh fruit, placed with sugar in glass bottles, by strewing on the surface of the contents salicylic acid in the proportion of a teaspoonful to 4 lbs., and by finally closing the vessels with salicylic paper. Many kinds of insects, attacking orchard-fruits, can be much subdued by placing loose grass around the trees, and burning it, while the insects largely harbor under it at day-dawn. Where water-pressure is available, insects can be destroyed by the mechanic force of spray, with avoidance of dangerous admixtures.

Prunus Caroliniana, Aiton.

South-Eastern States of North-America. Porcher regards it as one of the most beautiful and manageable evergreens of the States. It can be cut into any shape, and is much employed for quick and dense hedges. It can be grown on coast-land.

Prunus cerasifera, Ehrhart. (*P. Myrobalanus,* Desfontaines.)

The Cherry-Plumtree. Countries at and near the Caspian Sea. Of rather tall growth. The fruits called also Mirabelles (which name is given to some varieties of P. domestica as well), whence long ago the objectionable designation Myrobalane-Cherry-Plum arose. Among all kindred species it is this one, which flowers earliest, indeed before the development of its leaves, hence its claims for decorative horticulture. Splendid for hedges; grows vigorously in the poorest soil; ramification impenetrably dense; bears almost any extent of clipping; not hurt by exposure to sea-air [Daniels]. The fruit-yield is sometimes astonishingly large. On this and some other cultivated species, see also Koch's Dendrologie, 1869.

Prunus Cerasus, Linné.*

The Cherry-tree. Orient, especially in the countries near the Caspian Sea. The name applies strictly only to the species, distinguished by never assuming large dimensions, by emitting suckers, by smoothness of leaves and austerity and acidity of fruit. P. avium (Linné), the sweet-fruited Cherry-tree, seems naturally to extend as far as Middle Europe, and attains a high age, when the stem may acquire a diameter of 4 feet, produces no suckers, and has downy more wrinkled leaves, irrespective of some few other discrepancies. It afforded its fruit already to the ancient inhabitants of Switzerland in pre-historic times [Heer, Mortillet], and the tree was cultivated by the early Greeks also, according to historic records [A. de Candolle]. It is hardy in Norway in lat. 66° 30′ [Schue-

beler]. In the Himalayas it is cultivated up to 12,000 feet. The tree enjoys everywhere a comparative immunity from insect-attacks, but leaves and fruits were lately attacked severely by a fungus, namely Gnomonia erythrostoma (Fuckel). According to researches by Prof. A. B. Frank, the infested leaves do not drop, and must be mechanically removed in winter and immediately be burned. Cherry-trees have however sometimes also suffered seriously near Melbourne from the attacks of the Cherry-borer, Maroga gigantella; the larvæ of this insect infest occasionally also other species of Prunus; spraying with kerosene-emulsion or other insecticidal mixtures is recommended by Mr. French in his Handbook of Destructive Insects. Pieces of mirror-glass, strung on lines, will tend much to keep sparrows and other predatory birds from cherries and other fruits. Cherry-stones more particularly among the seeds of our ordinary table-fruits might be kept for being strewed about during pleasure-excursions in forests and other uncultivated places. Here in Victoria Cherry-trees and other ordinary hardy fruit-trees should also now be copiously planted in the Australian Alps, to which railways are gradually approaching, so as to provide these fruits and also kitchen-vegetables later in the season for the low-land markets, just as reversedly the Channel-Islands produce the early supplies for London. California exported 60,0.0 cases of dried or canned cherries in 1887 already.

Prunus Chisasa, Michaux. (*P. angustifolia,* Marsh.)

North-America, west of the Mississippi. On the praries it is only 3 to 4 feet high. Fruit spherical, red, rather small, with a tender usually agreeable pulp. Other species with edible fruit occur in North-America, such as P. pumila and P. Pennsylvanica (Linné); but their fruits are too small, to render these plants of importance for orchard-culture, though they also may become enlarged by rural treatment. Marsh's name is the oldest. Can be cultivated as far north as Christiania in West-Europe.

Prunus demissa, Walpers.

California. The Wild Plum of Utah. Worthy of improving cultivation. It fruits abundantly, often when only 2 or 3 feet high. It is of near affinity to P. Virginiana.

Prunus domestica, Linné.*

Plum-tree, Damson-tree, Prune-tree. From the Black Sea to Western China. In the countries at the Mediterranean Sea numerous varieties were cultivated even at the commencement of the Christian era. In Norway this species endures the winter to lat 64° [Professor Schuebeler]. The wood is sought for musical instruments and select turnery. For varieties, see Dr. Hogg's admiral "Fruit-Manual" and other kindred works. The "Zwetsch Variety is early in yield for one of the most profitable of any fi

for drying, but the best sorts need a temperate mild clime. In Southern Hungary and the adjoining countries Plums and Prunes are most extensively cultivated and form an important article of diet to the inhabitants, besides being exported in a dried state ; very large quantities are also used for the distillation of a strong liqueur, known as Slibowitz. The finest dried prunes are however produced in Southern France and largely exported. California sent away in 1887 about 40,000 cases of canned plums and 1,750,000 dried prunes. Among the most important varieties are Reine-Claude and the Mirabelle—whether fresh or dried, boiled or preserved, the Mirabelle is always delicious ; that variety is of easy growth in orchards, and can also most readily be reared for hedges. It is a prolific bearer [C. Mathieu]. The plum- and cherry-season would extend in S.E. Australia over five months, if alpine plantations were formed. Brigade-Surgeon J. Aitchison speaks of P. divaricata (Ledebour) as a native plum-or prune-tree in Afghanistan Mr. B. T. Galloway [in circular 10 of the United States Department of Agriculture in the division of vegetable pathology 1891] has as a final result of his researches recommended two remedial compositions against leaf-blight and powdery mildew as the best for orchard-trees:—1st. The "Bordeaux Mixture," prepared by dissolving 12 lbs of sulphate of copper in 20 gallons of water, to which slowly is to be added a mixture of 8 lbs unslaked lime stirred into 12 gallons of water. 2nd. The "Ammonial Solution," made by dissolving 5 ounces of carbonate of copper in 3 pints liquor of ammonia (diluted to 26 per cent. strength) and by pouring this into 45 gallons of water. Either of these two remedies is to be applied by a proper spraying pump—Nixon's being one of the best ; both can be cheaply prepared. Mr. Galloway has at one time thus treated successfully 400,000 young trees. The ammonial solution is the least expensive of the two and more easily prepared and applied.

Prunus Japonica, Thunberg.

The Wild Plum of Japan, A small, ornamental tree, cultivated for its often double flowers. The fruit edible.

Prunus ilicifolia, Nuttall.

California, In deep rich soil, valuable for evergreen hedges of intricate growth. Fruit about $\frac{1}{2}$ inch diameter, red or black, of a pleasant sub-acid flavor, but somewhat astringent [Gibbons].

Prunus insititia, Linné.

The Bullace. Middle and Southern Europe, North-Africa, Western Asia to the Himalayan mountains. Professor Heer has proved, that the lacustrine Swiss of the stone-age were already acquainted with the Bullace as well as the Sloe. This species yields some of the Damascene-Plums. P. cerasifera seems

descended from P. insititia, and this again may be the original wild plant of P. domestica [Loudon, J. Hooker]. P. Brutia (Terraciano) is a closely allied mountain-plant from Calabria.

unus Lauro-Cerasus, Linné.

The Cherry-Laurel. Persia and adjoining countries. A tall shrub or small tree, with evergreen remarkably shining foliage; the latter, as not quickly shrivelling, valuable for garlands and for other decorative purposes. Bears still fruit at 60° 23′ in West-Europe. From the leaves the medicinal laurel-water is distilled. An infusion of the leaves is very effective in destroying all kinds of insect-parasites on garden-plants, also recommended for mixing with whiting to kill flies in buildings.

Prunus Lusitanica, Linné.

The Portugal Cherry-Laurel. A small tree, seldom over 30 feet high, not of strictly industrial value, but mentioned here as one of the very hardiest among evergreen trees not coniferous. Indigenous also in Spain and perhaps the Canary Islands.

Prunus Mahaleb, Linné.

South-Europe and South-Western Asia. It deserves some attention on account of its scented seeds and also odorous wood, the latter used in turnery for pipes and other articles. The flowers are in use for perfumes. The tree is hardy in Norway to lat. 63° 26′. The kernels are used for making marasquino-liqueur [Prof. Wittstein].

Prunus maritima, Wangenheim.

The Beech-Plum of Eastern North-America. A shrubby species, of service not only for covering coast-sands, but also for its fruit, which is crimson or purple, globular, measuring from ½ to 1 inch. Information on these and other varieties and on orchard-fruits in general may be sought in Hogg's "Fruit-Manual."

Prunus occidentalis, Swartz.

Mountains of the Antilles. A tall tree. Mr. W. G. Lyon reports the fruit as luscious in a cultivated state; this plum-like fruit, according to Grisebach, is nearly one inch long.

Prunus Padus, Linné.

The Birds' Cherry-tree. Europe, Northern and Western Asia, extending to the Himalayas and the mountains of Northern Africa. A small tree. Foliage deciduous; the leaves distilled for medicinal purposes, the bark also used therapeutically.

Prunus Persica, J. Hooker.* (*Amygdalus Persica,* Linné.)

China, not really indigenous to Persia, as ascertained by Alph. de Candolle. Wild, according to Juworski, also in Afghanistan. The Peach-tree, as delightful through its early flowering as through the ready yield of its luscious fruit. Not quite so hardy as the Almond-tree in cooler climes, though enduring the clime of England. In the southern of the United States peaches are not rarely turned to account for alcoholic fermentation and distillation [Rhind . California exported 10 million pounds of canned and over a million pounds of dried peaches in 1887. Peaches on trees grown near the Darling-River have attained a weight of eleven ounces [Mrs. M. B. Kennedy]. Prolific crops are also obtained in the inland-country of tropical Australia, indeed the Peach-tree has next to the Fig-tree shown itself better capable to cope with the extremes of temperature in Central Australia than any other, even the Apricot-tree; thus it bore a heat of 150–160° F. exposed to the sun [Kempe]. The Nectarine, which is characterised by smooth fruits, is a variety merely. In Afghanistan some particular kind has a kernel of almost Almond-taste [Dr. Aitchison], Peach-trees occasionally bear fruit precociously even in the second year after sowing. For preserving, Peaches should be halved, boiled 8 minutes, and sugar be used at the rate of 6 ounces to a quart of water [Shelton]. Bees resort to the flowers. The bark used as an anthelmintic. The necessity of reducing the genus Amygdalus to that of Prunus was indicated in 1812 already by Stokes (Bot. Mat. Met. III. 101) and in 1813 by F. G. Hayne (Arznei-Gewaechse IV. 38).

Prunus Pseudo-Cerasus, Lindley. (*P. Puddum,* Roxburgh.)

The "Sakura" of Japan, extending to Upper India. A large shady tree, its stem attaining two feet in diameter, charming to view when bearing its profusion of flowers. The fruit is of the size of small cherries and of pleasant and refreshing taste, though never quite sweet [Wallich]. It is this tree which supplies mainly the wood so extensively required for xylography in Japan [Dupont].

Prunus serotina, Ehrhart.

The Black Cherry-tree of Eastern North-America. Of comparatively quick growth. In Virginia and Alabama the tree attains a height of about 100 feet, with a stem 4 feet in diameter; it prefers rich porous soil in the upper parts of valleys. Fruit slightly bitter, but with a pleasant vinous flavor; wood compact, light, easily worked, not liable to warp [Sargent], very valuable for cabinet- and sash-makers [A. Gray]; of a pale-red color, dense, fine-grained; when polished as beautiful as mahogany-wood [Robb and Simmonds]. Will live on the poorest soil, and even within the salt-spray of the coast. Readily raised from seeds and transplanted,

not succumbing under rough usage [Sargent]. Not infested by caterpillars [Fernow]. Bark particularly valuable in medicine [Dr. Porcher].

Prunus spinosa, Linné.

The Sloe or Blackthorn. Wild in many parts of Europe. Indigenous in Norway to latitude 60° 8′; but it will endure the winter even to lat. 67° 56′ [Schuebeler]. Hardly at all liable to be attacked by insects. With its flowers it is one of the earliest plants to announce the spring. Its tendency to throw out suckers renders the bush less adapted for hedges of gardens than of fields, but these suckers furnish material for walking-sticks, much liked on account of their dark bark. The small globular fruits can be made into preserves. Perhaps the fruit of some of the species from Eastern Asia, California and tropical America may be improved by horticultural skill. The sloe and others might with advantage be naturalised on forest-streams.

Prunus subcordata, Bentham.

Wild Plum of California. A shrub with pleasantly acid autumnal fruit, which is reddish and nearly an inch long [Prof. A. Gray].

Prunus tomentosa, Thunberg.

Northern China. A very hardy species with cherry-like edible fruits.

Prunus Virginiana, Linné.

The Choke Cherry-tree of the Eastern United States. In a mild clime and fertile soil this tree attains a height of about 100 feet and a stem-circumference of 16 feet. Endures the winters of Norway to lat. 67° 56′ [Schuebeler] The wood is compact, fine-grained, and not liable to warp when perfectly seasoned, of a dull light-red tint, deepening with age. The fruit finally loses its acerbity. The bark used in medicine.

Psamma arenaria, Roemer and Schultes.* (*P. littoralis,* Beauvois; *Calamagrostis arenaria,* Roth.)

The Morram, Marrem or British Bent-grass. Sand-coasts of Europe, North-Africa and Eastern North-America. One of the most important of reedy grasses with long descending roots, to bind moving drift-sands on the sea-shore, for the consolidation of which this tall grass and Elymus arenarius are chiefly employed in Europe. It delights in the worst of drift-sands, and for its full development gradual accumulation of fresh sands around it becomes necessary [Wesley]: hence it never gets suffocated. Easily started from portions of roots for new growth, but also often sown. A wooden palisade should be erected near high-water mark, to promote the formation of an artificial dune; under such shelter the Marrem

seeds are sown and covered with brushwood, to prevent the seed thus sown from moving. (Indian Forester XIII., 450.) The plant will by gradual up-growth finally form stems and roots, sanded in to a depth of fully 100 feet. Psamma Baltica (R. & S.), from the Baltic and North-Sea, serves the same purpose. Both can also be used in the manner of Sparta for paper material, for tying and for mats. Like Elymus arenarius, they are not touched by grazing animals. P. arenaria collects the sand-heaps at the tops of ridges, while the Elymus fastens their sides.

Psammogeton setifolium, Boissier.

Persia and Afghanistan. An annual herb, the fruit of which is locally used as an aromatic condiment and as a medicine [Brigade Surgeon J. Aitchison].

Pseudophoenix Sargenti, H. Wendland.

Islets of Florida. A palm seldom above 25 feet high, therefore easily placed. Comparatively hardy.

Psidium acidum, Martius.

Higher regions on the Amazon-River. A tree, at length 30 feet high; its guava-fruit pale-yellow and of apple-size.

Psidium Araca, Raddi.*

From the West-Indies and Guiana to Peru and Southern Brazil, where it is found in dry high-lying places. This is one of the edible guavas, already recorded by Piso and Marcgrav. The greenish-yellow berry is of exquisite taste.

Psidium arboreum, Vellozo.

Brazil, province of Rio de Janeiro. The guava-fruit of this plant measures about one inch, and is of excellent flavor.

Psidium Cattleyanum, Sabine.*

The Purple Guava. Brazil and Uruguay. One of the hardiest of the guava-bushes, attaining finally a height of 20 feet. The purple berries are seldom above an inch long, but, as well known, of delicious flavor and taste, resembling thus far strawberries. P. buxifolium (Nuttall) of Florida seems nearly related to this species.

Psidium chrysophyllum, F. v. Mueller. (*Abbevillea chrysophylla,* Berg.)

The Guabiroba do Mato of South-Brazil. This tree attains a height of about 30 feet. The fruit is generally not larger than a cherry. Perhaps other species of the section Abbevillea would be hardy and worthy of cultivation.

Psidium cinereum, Martius.

Brazil, provinces Minas Geraes and Sao Paulo. Also yielding an edible fruit.

Psidium cordatum, Sims.

The Spice-Guava. West-Indies. This attains the height of a tree. Its fruit is edible. Probably hardy in sub-tropic regions.

Psidium cuneatum, Cambessedes.

Brazil, province Minas Geraes. Fruit greenish, of the size of a Mirabelle-plum.

Psidium grandifolium, Martius.

Brazil, provinces Rio Grand do Sul, Parana, Sao Paulo, Minas Geraes, where the climate is similar to Southern Queensland. A shrub of rather dwarf growth. The berries edible, size of a walnut.

Psidium Guayava, Linné.* (*P. pomiferum*, Linné; *P. pyriferum*, Linné.)

The larger Yellow Guava. From the West-Indies and Mexico to South-Brazil. This handsome evergreen and useful bush should engage universal attention anywhere in warm lowlands, for the sake of its aromatic wholesome berries, which will attain the size of a hen's egg, and can be coverted into a delicious jelly. The pulp is generally cream-colored or reddish, but varies in the many varieties, which have arisen in culture, some of them bearing all the year round. Propagation is easy from suckers, cuttings or seeds. This big shrub is easily held under control in extra tropic countries, but in the warmest and moistest tropical regions it may become irrepressible, as it spreads readily from suckers, and gets disseminated by birds and cattle easily [R. L. Holmes]. Many other berry-bearing Myrtaceæ of the genera Psidium, Myrtus, Myrcia, Marliera, Calyptranthes and Eugenia furnish edible fruits in Brazil and other tropical countries; but we are not aware of their degrees of hardiness. Berg enumerates as esculent more than half a hundred from Brazil alone, of which the species of Campomanesia may safely be transferred to Psidium.

Psidium incanescens, Martius.

Brazil, from Minas Geraes to Rio Grande do Sul. This guava-bush attains a height of 8 feet. Berry edible.

Psidium lineatifolium, Persoon.

Mountains of Brazil. Berry about 1 inch in diameter.

Psidium malifolium, F. v. Mueller. (*Campomanesia malifolia*, Berg.

Urugnay. Berry about 1 inch in diameter.

Psidium polycarpon, Al. Anderson.*

From Guiana to Brazil, also in Trinidad. A comparatively small shrub, bearing prolifically and almost continuously its yellow berries, which are of the size of a large cherry and of exquisite taste.

Psidium rufum, Martius.

Brazil, in the province of Minas Geraes, on sub-alpine heights. This guava-bush gains finally a height of 10 feet, and is probably the hardiest of all the species producing palatable fruit.

Psophocarpus tetragonolobus, De Candolle.

Tropical Africa, perhaps to Madagascar. A climber with annual stem; pods to one foot long, used as peas. P. palustris (Desvaux) is closely allied, and has shorter pods. Likely to ripen fruits also outside the tropics.

Psoralea esculenta, Pursh.

North-America. This herb is mentioned here, as its tuberous roots, known as the Prairie-Turnip, may be capable of great improvement by cultivatian, and of thus becoming a valuable esculent.

Psychotria Ecklioniana, F. v. Mueller. (*Grumilia cymosa,* E. Meyer.)

South-Africa. Dr. Pappe describes the wood of this tree as of a beautiful citron-yellow.

Pterocarpus Indicus, Roxburgh.

The Lingo of China and India. A tree of considerable dimensions, famed for its flame-red wood. It furnishes also a kind of dragon-blood-resin.

Pterocarpus marsupium, Roxburgh.

India, ascending in Ceylon and the Circars to fully 3,000 feet altitude; hence this tree would doubtless grow without protection in those tracts of the temperate zone, which are free from frost. The tree is large when in its final development; its foliage is deciduous. It exudes the best medicinal kino, which contains about 75 per cent. of tannic acid. P. santalinus (Linné fil.), which provides the Saunders or Red Sandal-Wood, is also indigenous to the mountains of India and important for dye-purposes.

Pterocarya fraxinifolia, Kunth.

From Central Asiatic Russia to Persia. A kind of Walnut-tree, which with P. stenoptera (Cas. de Candolle) on Dr. Hance's recommendation should be adopted as trees for both ornament and timber, and so perhaps also the Japanese species, P. rhoifolia (Siebold and Zuccarini).

Ptilotus hemisteirus, F. v. Mueller.

Desert-regions of Australia. On this herb sheep do particularly well; so on some other species, for instance P. alopecuroides [Mrs. M. Heal]. Easily disseminated.

Pteropyrum Aucheri, Jaubert and Spach.

Persia and Afghanistan, A desert-shrub, remarkable for the brilliancy of its scarlet fruits. Used locally for fodder [Aitchison], therefore perhaps deserving translocation to the deserts of Australia and other parts of the globe.

Ptychosperma Alexandræ, F. v. Mueller.

The Alexandra-Palm. Queensland, as well in tropical as extra-tropical latitudes. The tallest of Australian palms, and one of the noblest forms in the whole empire of vegetation. Aged it exceeds 100 feet in height, and is likely destined to grace many shady moist groves yet outside the tropics, so long as they are free from frost, as this palm seems less tender than most others. The demand for seeds has already been enormous; for long voyages they are best packed fresh into the sawdust of resinous kinds of wood.

Ptychosperma Arfakiana, Beccari.

New Guinea, reaching elevations of 5,000 feet in comparatively temperate regions. Height as much as 30 feet.

Ptychosperma Cunninghami, Hermann Wendland.

East-Australia, as far south as Illawarra; thus one of the most southern of all palms. This also is a very high species, destined to take a prominent position in decorative plantations even far beyond the tropics. Several congeners occur in Fiji and other islands of the Pacific Ocean, and others again might be obtained from India, but they are probably not so hardy as those just mentioned. Though strictly speaking of no direct industrial value, these palms are important for horticultural trade, and are objects eminently fitted for experiments in acclimation.

Ptychosperma disticha, Miquel. (*Areca disticha,* Griffith.)

Assam, up to 4,000 feet.

Ptychosperma elegans, Blume. (*P. Seaforthia,* Miquel; *Seaforthia elegans,* R. Brown.)

Litoral forests of tropical Australia. Also a magnificent Feather palm. Its leaflets are erose. It may prove hardy in mild extropic regions.

Ptychosperma laccospadix, Bentham.

North-Eastern Australia up to the cool elevation of 5,000 feet [Sayer and Davidson]. Height to 15 feet, with a very slender stem, thus well adapted for decoration of rooms.

Ptychosperma Musschenbroekiana, Beccari.

Ternate, Insular India, up to 3,000 feet. Height of this palm reaching 90 feet. Almost sure to be hardy in sheltered localities of the warmer temperate zone.

Pueraria Thunbergiana, Bentham.

Japan. There starch is prepared from the tubers of this climber. The fibre of the bark is woven locally into cloth [Dyer].

Pueraria tuberosa, De Candolle.

Southern Asia, up to 4,000 feet. A tall woody twiner. Its large tubers are edible, and might improve by culture.

Puglonium cornutum, Gaertner.

From the Caspian Sea to China. This herb is grown by the Mongols as a vegetable [Hance].

Punica Granatum, Linné.

The Pomegranate. North-Africa and South-Westesn Asia, in the Himalayas up to 6,000 feet. Well-known for its showy habit, rich-colored flowers, peculiar fruit and medicinal astringency, but much overlooked regarding its value as a hedge-plant. Will grow freely from cuttings. Purposely cultivated in Algeria for walking-sticks [J. R. Jackson]. Passed with very few other plants through years of drought in Central Australia [Rev. H. Kempe]. The bark contains 32 per cent. tannin [Muspratt], and is also used for dyeing the yellow Morocco-leather [Oliver]. The peel of the fruit serves likewise for dye. For anthelmintic purposes particularly the root-bark is administered. Concerning pelletierin and other alkaloids from the root-bark, ample information is given in Husemann's and Hilger's Pflanzenstoffe (1884). A second species was discovered by Prof. I. Balfour in Socotra.

Pycnanthemum incanum, Michaux.

North-America. A perennial herb, in odor resembling both Pennyroyal and Spearmint. It likes to grow on rocky woodland, and on such it might be easily naturalised.

Pycnanthemum montanum, Michaux.

The Mountain-Mint of North-America. A perennial herb of pleasant, aromatic, mint-like taste. These two particular species have been chosen from several North-American kinds to demon-

strate, that we may add by their introduction to the variety of our odorous garden-herbs. They may also be subjected with advantage to distillation.

Pyrularia edulis, Meissner.

Nepal, Khasia, Sikkim. A large umbrageous tree. The drupaceous fruit is used by the inhabitants for food. A few other species occur in Upper India, one on the high mountains of Ceylon, and one in North-America. The latter, P. pubera (Michaux), can be utilised for the oil of its nuts.

Pyrus aucuparia, Gaertner.

Europe, Northern and Middle Asia, Madeira, occurring also, but slightly altered, in North-America. The Rowan and also but inappropriately called the Mountain-Ash. Height seldom over 30 feet. Succeeds still where ordinary orchard-culture ceases in coldest regions. Wood particularly valuable for machinery and pottery-work, also crates. Walking-sticks from this plant slender but strong [J. R. Jackson]. A variety with sweet fruit, discovered in Austria by F. Kraetzl, is a new acquisition.

Pyrus coronaria, Linné.

The Crab-Apple of North-America. This showy species is mentioned here as worthy of trial-culture, since it is likely, that it would serve well as stock for grafting. Best grown in glades. Wood nearly as tough for screw-work as that of the pear-tree [Robb].

Pyrus communis, Linné.*

The Pear-tree. Middle and Southern Europe, Western Asia. Well known even at the time of Homer; and many varieties were cultivated in Italy at the commencement of the Christian era; pears were available also to the lacustrine people of Switzerland, Lombardy and Savoy, but seemingly not so extensively as the apple. Prof. C. Koch regards the Chinese Pyrus Achras (Gaertner), which is the oldest name for P. Chinensis of Desfontaines and Lindley, as the wild plant, from which all our cultivated varieties of pears have originated. The pear-tree is cultivated up to 10,000 feet in the Himalayas; like the apple-tree, it sets no fruit in tropical lowlands, but on the other hand it will bear a good deal of frost, being grown in Norway to lat 63° 52'. The tree attains an age of over three hundred years, fully bearing. At Yarmouth a tree over a 100 years old has borne as many as 26,800 pears in a year; the circumference of its crown is 126 feet. A Huffcap Pear-tree at Hadley, in Worcestershire, yielded two hogsheads of perry in each year for a lengthened period [Masters]. Pear-wo
used by wood-engravers, turners and instrument-makers. A
glycosid, namely phlorrhizin, is obtainable from the bark of
and pear-trees, particularly from that of the root; while a
alkaloid, namely trimethylamin, can be prepared from the

Pyrus auricularis, Knoop (P. Polveria, L.), the Bollwiller-Pear, is a hybrid between P. communis and P. Aria, Ehrhart. Curious fruits have been produced latterly in North-America by the hybridization of the apple with the pear. The Chinese and Japanese Sand-Pear furnishes excellent stock for grafting [E. Goeze]. The Muscatel-Pear is particularly sought by confectioners [Mathieu]. Pears for preserving should be halved, boiled 20 minutes with 6 ounces of sugar to a quart of water [Shelton]. The generic writing of Pirus is inadmissable, as even Plinius used both Pirus and Pyrus in his writings, and as the latter wording was already adopted by Malpighi and fixed for the genus by Linné. The flowers of all the leading European fruit-trees afford nectar for honey to bees. To subdue the Fusicladium-rust on pears and apples, the trees, just after flowering, should be syringed with a solution in the proportion of 1 lb. sulphate of copper, 1 lb of slaked lime, and 4 gallons of water, which operation is to be repeated a month later [R. Goethe].

Pyrus Cydonia, Linné. (*Cydonia vulgaris,* Persoon.)

The Quince. Countries at the Caspian Sea. Reared in South-Europe from antiquity; in the Himalayas its culture reaches to 5,500 feet elevation, in Norway to Christiania. The Portuguese variety bears extremely large fruit. The preserved quince is one of the most agreeable of fruits. The seeds impart copiously to water a tasteless mucilage. Quinces are not readily attacked by sparrows.

Pyrus Germanica, J. Hooker. (*Mespilus Germanica,* Linné.).

The Medlar. Southern Europe, Western Asia. The ordinary medlar-fruits become edible after some storage. A large-fruited variety of excellent taste is cultivated in South-Europe. P. Maulei (Masters) is a closely cognate plant, with golden-yellow edible fruit, particularly fit for preserves. Medlar-Jelly has come recently into use through Mr. T. F. Rivers.

Pyrus Japonica, Thunberg.

Japan. One of the prettiest of small hedge-bushes, and one of the earliest flowering. Under favorable circumstances it will produce its quince-like fruit. It is one of the earliest species, so valuable to the apiarist.

Pyrus Malus, Linné.*

The Apple-tree. Europe, Western Asia, ascending the Himalayas to 11,000 feet. Shown to have been in culture already in Switzerland and Northern Italy prior to historic records, though Professor C. Koch regards neither the wild and variable crab-trees, nor the pear, as original denizens of Middle and Northern Europe, but simply as strayed from cultivation and degenerated. Bees resort to the flowers. For reference to varieties Dr. Hogg's fruit-manual

is also in this instance most handy. Koch traces some sorts of cultivated apples to P. pumila (Miller) of South-Western Asia; as other original forms he notes the P. dasyphylla (Borkhausen), P. silvestris and P. prunifolia (Willdenow) of Middle and Western Asia. This tree is one of longevity; Mr. H. C. Hovey gives records of an apple-tree in Connecticut, which at the age of 175 years measured about 14 feet in circumference at 3 feet from the ground, the diameter of the top of the tree being over 100 feet. In Prof. Meehan's *Gardener's Monthly* is a record of the fecundity of an apple-tree in New England, given by Mr. W. S. Platt, of Cheshire; its eight branches spread over six rods, and five of the branches bore in one year over 100 bushels of apples, the bearing taking place alternately with the other three branches. The tree fruits still at Mysore, but there the trees remain of stunted growth [J. Cameron]. Ananas and Apples bear fruit alongside each other at the tropic of capricorn in East-Australia [Edgar]. Orchards, particularly also of apple-trees have been formed in sandy heath-ground with the best results. Apple-trees will endure the winters of Norway to lat. 65° 28′ [Professor Schuebeler]. Quite recently an apple without any core and seeds was brought under notice by Mr. Marylander, of Baltimore. It originated in Virginia. The tree is a rich bearer, although the flowers are never properly developed except the ovulary; the fruit is of excellent taste, yellowish throughout, and reminds of the Golden Pearmain. In Europe apple-trees and other fruit-trees are occasionally bored by the Scolytus destructor. One of the best methods, to ward off the two kinds of codlin-moth from apple-trees and other fruit-trees, consists in tying rags from baggings loosely around the base of the stem, as the larvæ will seek shelter therein, and may thus be captured in large numbers; loose bark infested should be removed. Mr. C. French, Government Entomologist for Victoria, recommends spraying with a solution of 1 lb. London Purple (which contains, however, a larger percentage of arsenic) in 100 or 150 gallons of water, as soon as the fruit begins to form. In his valuable Handbook of Destructive Insects he also gives descriptions and illustrations of different spray-pumps. One of the remedies to subdue the troublesome "Aphis" of the apple-tree, caused by the Schizoneura lanigera, is gas-lime [W. G. Klee]; further Paris-green sprayed early in the season; according to Mr. James Roberts, an application late in autumn of a solution of sulphate of copper (similar in strength to that used for dressing seed-grain of cereals against smut) to the roots of the apple-tree or even the pounded sulphate of copper simply scattered on the ground under the tree. The strength of the solution to be employed is 4 lbs. to a cask of water. More generally known as efficient is the use of kerosene-emulsion, or dissolved whaleoil- or resin-soap against apple-blight, applied by direct contact thoroughly repeatedly to the affected portions of the tree. Good service ren in this respect a dressing of the roots with strongly ammon manures. A few varieties of apples resist Aphis; notabl varieties known as Northern Spy and Winter Majetin [C. Fr

Hillenmeyer recommends slack-lime brushings over stems and branches of apple-trees against lichens, mosses and against diseases produced by growth of minute fungaceous parasites. Succulent apples contain about 70 per cent. of juice, a remark which may serve in calculating the yield of cider. Nearly 300 million gallons of cider were produced in 1887 in Northern France. A pleasant and wholesome beverage is easily prepared by boiling 2 lbs. of apples in some water till disintegrated, increasing the fluid by hot water to 1 gallon, and adding about 1 lb. of sugar and after cooling a little yeast; strain when fermentation is well advanced, and bottle off lightly corked; it will be ready in two days and will keep for a week (*Journ. Soc. Arts*, Sept., 1887). Wood-wool from soft pine-wood is the best packing material for fresh fruit on long transit, by virtue of lightness, elasticity, airiness and antisceptic property. The best dried apples and similar fruits are obtained by submitting them, according to the new American method, to a blast of cold air. Mr. E. Hoesch has adopted the use of pure sulphurous dioxyde of lime in a weak solution, for dipping into it fruits or vegetables to be dried, with a view of preventing their turning dark by the exsiccation-process [See *Wiener Garten-Zeitung*, 1890, p. 189–192]. The United States sent to England in the season 1880–1 about 1,350,000 barrels of apples, irrespective of the large quantity sent by Canada. Latterly the value of American apples imported into Britain has amounted to two millions sterling a year.

Pyrus nivalis, Jacquin.

The Snow-Pear. Middle and Southern Europe. This would be adapted for orchards in higher mountain-regions. The fruit becomes soft and edible through exposure to snow. P. amygdaliformis (Villars) or P. Kotschyana (Boissier) is probably the wild state of this tree. Pear-cider is often made of the fruit of this species also.

Pyrus rivularis, Douglas.

The Crabapple-tree of North-Western America. Fruit prized by the aborigines for food [G. Dawson]; likely amenable to cultural improvements. Dr. C. Koch draws attention to the probable identity of P. Toringo (Siebold) from Japan.

Pyrus salicifolia, Linné.

Greece, Turkey, Persia, South-Western Russia. Hardy at Christiania. Though its fruit, which softens slowly, is edible, this tree is mainly utilised as a superior stock for grafting.

Pyrus Sorbus, Gaertner.

Countries at the Mediterranean Sea in mountain-regions. Finally a conspicuous tree, with a stem occasionally of 12 feet

circumference [Prof. C. Koch]. The fruit when softened by age can be consumed like that of the medlar [Prof. Naudin]. It serves also for the preparation of a kind of cider.

Quercus Ægilops, Linné.*

South-Europe, also Syria. A nearly evergreen tree of the size of the British oak. The cups, known as Valonia, used for tanning and dyeing; the unripe acorns, called Camata or Camatena, for the same purpose. Valonia is largely exported from Smyrna to London. Greece used to produce annually 10,000 tons, worth as much as £18 per ton. The supply is inadequate to present demand. 31,376 tons of Valonia, worth about £454,630, were imported into the United Kingdom in 1889. Valonia (Wallones) produces a rich bloom on leather, which latter also becomes less permeable to water [Muspratt]. The ripe acorns are eaten raw or boiled. This oak is also recommended as a fine avenue-tree. It bears considerable frost. The wood is capital for furniture. Dr. Kotschy separates Q. Ægilops into several species, of which Q. Græca, Q. oophora and Q. Vallonea yield the mercantile article.

Quercus agrifolia, Née.

California and Mexico. One of the most magnificent and picturesque among evergreen oaks, with dense, wide-spreading foliage. The thick bark available for tanning. According to Dr. Gibbons this tree attains a height of about 100 feet, a stem-diameter of 8 feet and a ramification of 125 feet breadth. Foliage nearly or quite persistent. Woodcutters distinguish two varieties, one with red and one with pale wood. It grows naturally near the sea, and luxuriates in the deep soil of valleys, but also on the tops of mountains. The value of its timber is not fully appreciated. Although brittle when green and perishable if exposed to the weather, it becomes almost as hard and strong as live-oak, if properly seasoned, and is especially adapted for ships' knees.

Quercus alba, Linné.*

The White or Quebec-Oak. From Canada to Florida, west to Texas. A most valuable timber-tree, becoming fully 100 feet high; diameter of stem to 7 feet, trunk sometimes 65 feet long to first branch. Rate of stem-growth in Nebraska according to Governor Furnas 29 inches circumferentially in 22 years. Attains a great age; succeeds best in rich woodlands, and is of quicker growth than the English oak. The timber is pliable, most durable, one of the very best of all woods for casks, also of first-class value for cabinet-work, for machinery, spokes, naves, beams, plough-handles, agricultural implements, carriages, flooring, basket-material [Sargent] and railway-ties [Robb]; it is also largely employed in ship-building; the young saplings serve for hoops and whip-handles. The bark contains about 8 per cent. tannin, and is used also in medicine.

Quercus aquatica, Walter.

North-America. Height of tree often 60 feet; it furnishes a superior bark for tanning. This oak should be chosen for planting in wet ground or for bordering streams, It is of remarkably quick growth. Although the wood is not of much value, yet the tree is a great favorite as a shade-tree, being of rapid growth and fine outline. Prof. C. Koch identified this with the true Q. nigra of Linnè.

Quercus Ballota, Desfontaines.

Countries at the Mediterranean Sea. Regarded by P. P. Webb, Wilkomm and Lange as specifically distinct in its characteristics from Q. Ilex, being also of a more delicate constitution. The Ballota-acorns form really a considerable share of agreeable table-fruits in the countries of their nativity [Dr. R. Prior]. Much used for feeding swine and working cattle, for the latter considered as good as oats [Campbell].

Quercus bicolor, Willdenow.

Southern White Oak. South-Eastern States of North-America. Closely allied to Q. Prinus, but vernacularly distinguished as Basket-Oak; it thrives best in deep, damp forest-soil, and is regarded as the most important hardwood-tree in the Gulf-region; will endure flooding; height reaching 120 feet, stem-length to 70 feet. The growth comparatively slow; wood similar in applicability to that of the white oak heavy, hard, tough and very strong, very durable in contact with water [B. E. Fernow]; it is split readily into thin strips of great strength and flexibility for rough baskets [Dr. C. Mohr].

Quercus calliprinos, Webb.

Eastern Countries at the Mediterranean Sea. To this species belongs the sacred huge Abraham's Oak.

Quercus Castanea, Née.

The Mexican Chestnut-Oak. Evergreen. It furnishes edible acorns.

Quercus Cerris, Linné.

Moss-cupped or Turkey-Oak. Southern Europe, South-Western Asia. Hardy still at Christiania. Of the height of the English oak; in suitable localities of quick growth. The foliage deciduous or also evergreen or nearly so. The wood available for wheelwrights, cabinet-makers, turners, coopers, also for builders generally. It is still firmer and harder than that of the British oak; the sapwood larger, the heartwood of a more saturated brown, and the large rays more numerous, giving it a most varied and beautiful wainscot-grain [Sir D. Brandis, Prof. C. Koch].

Quercus Chinensis, Bunge.

Northern China. One of the hardiest among the evergreen oaks.

Quercus chrysolepis, Liebmann *

The Live-Oak of California. This evergreen oak attains a height of fully 100 feet, with a stem-diameter of 10 feet towards the base; spread of branches occasionally 150 feet [Prof. Brewer]. Supplies the hardest oak-wood on the Pacific coast. Dr. Gibbons observes, that it holds a primary rank among Californian forest-trees, but is of sparse occurrence; in suitable soil on the sides of mountains it is of giant-growth, spreading out in magnificent proportions. In toughness and density of wood it represents the live-oak of Florida, being thus highly useful to implement-makers, wheelwrights and machinists; the ivory-like appearance of the wood befits it particularly for inlaying [Dr. Kellogg]. The Californian State-Board for Forestry records, that as naval building material the wood has hardly its equal. In California one particular of its Tan-Oaks, probably Q. densiflora, furnished latterly about 30,000 cords of bark annually.

Quercus coccifera, Linné.

The deciduous Kermes-Oak of South-Europe, North-Africa and South-Western Asia. So called from the red dye, furnished by the Coccus ilicis from this oak. It also supplies tanners' bark, containing about 8 per cent. tannin [Muspratt], 15 per cent. [T. Christy]. The tree likes rich woodlands.

Quercus coccinea, Wangenheim.*

The Black Oak of Eastern North-America. Height to about 100 feet; stem-diameter to 5 feet. Foliage deciduous; its autumn tint magnificent. The tree thrives best in rich woodlands and moist soil. The timber is almost as durable as that of the white oak, and in use for flooring and other carpenters' work. Rate of growth about the same as that of the red oak. The yellow dye, known as quercitron, comes from this tree; it is much more powerful than that of woad [Bancroft]. With alumina the tinge of the bark is bright yellow, with oxyde of tin it is orange, with oxyde of iron it is drab [Porcher]. Q. velutina (Lamarck) or Q tinctoria (Bartram) has been called a variety of this. According to Sargent, it produces timber of close grain and great durability, utilised for carriage-building, cooperage and various constructions; the bitter inner bark yields a yellow dye. The bark of the variety called scarlet oak is practically far inferior in value to that of the black oak [Meehan]. Bark contains about 8 per cent. of tannic acid. Dr. Engelmann found the black oaks twice as rapid in growth as the white oaks of the United States. Bartram's oak (Q. heterophylla) is according to him, a hybrid between the willow-oak and scarlet oak. Hybrid oaks produce acorns capable of germination.

Quercus cornea, Loureiro.

China. An evergreen tree, at length 40 feet high. Acorns used for food. To this species is closely related O. rotundata (Blume) from Java.

Quercus corrugata, Hooker.

Mexico. Attains a height of about 80 feet. The acorns are as large as those of Q. Skinneri.

Quercus cuspidata, Thunberg.

Japan. A magnificent evergreen oak, grand in its proportions; bears acorns in bunches or strings, of very sweet taste when baked like chestnuts, but only of small size [F. C. Christy]. These acorns boiled or roasted, are regularly sold in Japan for food [Rein].

Quercus cyclophora, Endlicher.

Malacca and Penang. but not reaching higher elevations than 3,000 feet. Noted here as one of the tallest of all Oaks, to 150 feet, and as producing acorns fully $1\frac{1}{2}$ inches broad.

Quercus densiflora, Hooker and Arnott.*

Californian Chestnut-Oak. A large evergreen tree of beautiful outline, dense foliage and compact growth. Stem-diameter finally to 5 feet. Very hardy, having withstood the severest winters at Edinburgh with a temperature of 0° F. [Gorlie]. Bark very valuable for tanning; wood however subject to rapid decay [Prof. Bolander.] For fuller information on West-American oaks refer to Kellogg and Green's illustrated publication, 1889.

Quercus dentata, Thunberg.*

Manchuria, Northern China, Japan. This is one of the species, on which the Oak-silkworm (the Yama Mayon) lives. Franchet and Savatier enumerate 22 distinct species of oaks as indigenous to Japan.

Quercus dilatata, Lindley.

Afghanistan and Himalaya up to 9,000 feet; evergreen; attains a height of 80 feet. Gregarious, therefore likely naturalized with facility. Wood durable, locally used for building, implements, jampan-poles and other requisites [Gamble]. Foliage extensively lopped for fodder of cattle, sheep and goats. The last remark applies also to Q lannginosa (D. Don) of Nepal.

Quercus Douglasii, Hooker and Arnott.

The Blue Oak of California. Stem reaching 9 feet in circumference [Brewer]. Resembles the white oak in the quality of its timber, its wood being particularly used in wheelwrights' work.

Quercus falcata, Michaux.

South-Eastern States of North-America. Known as Spanish Oak. A tree, attaining a height of 80 feet, with a stem 5 feet in diameter. Foliage deciduous. It lives in dry sandy ground, and can also be utilised for sea-coasts. Produces an excellent tanners' bark, and also galls for superior ink. The wood is finer grained and more durable than that of Q. rubra, and used for staves, railway-carriages and in ship-building [C. Mohr]. Prof. C. Koch points out, that Q. cuneata (Wangenheim) is the oldest name for this species.

Quercus Garryana, Douglas.

North-Western America, along the coast between the 38th and 50th degrees. The only species in Oregon and British Columbia [S. Watson]. A tree, to 100 feet high or more, with a stem often 6 feet in diameter. This, with Q. Douglasii and Q. lobata, passes as Californian White Oak. The timber is remarkably pale for an oak, hard and fine-grained, of great strength and durability, well suited for almost every kind of construction, for which the white or the British Oak is employed. The acorns, being sweet and agreeable, form an excellent mash for hogs.

Quercus glabra, Thunberg.

Japan. Evergreen. The acorns are consumed for food by the Japanese.

Quercus glauca, Thunberg.

The Kashi of Japan, extending to the outer Himalayas. A truly magnificent evergreen tree, to 80 feet high. The hard and close-grained wood is chosen there for select tools, particularly planes and utensils [Christy]. Indian accounts of the wood are less favorable.

Quercus Griffithii, J. Hooker.

Khasia, Naga, Burmah, up to 6000 feet. Nearly allied to Q. aliena (Blume). A large tree with deciduous leaves. The wood resembles more that of the British Oak than that of any other Indian species [Gamble]. Locally much in use.

Quercus Ilex, Linné.

The Holly-Oak of South-Europe; extending also to Algeria and to the Himalayas, which it ascends up to about 10,000 feet. H[illegible] of tree rather less than that of the English oak, but occasions[illegible] is very lofty. Wood in use for shipbuilding and wheelwr[illegible] work, tools, agricultural implements, but requires to be seasoned [Gamble]. Yields also good tan-bark.

Quercus incana, Roxburgh.

Himalayas, at elevations between 3,000 and 8,000 feet, thence to Upper Burmah. A beautiful gregarious evergeen tree of great dimensions. Young branchlets in spring, as noted by Sir D. Brandis, from whitish to lilac-colored. Mr. Simmonds reminds us, that a silkworm (Antheræa Roylei), producing large cocoons, lives on this oak. In its native localities Q. lanuginosa (D. Don) is associated with it.

Quercus infectoria, Olivier.

Countries on the Mediterranean Sea, extending to Persia. A tree, deciduous in its foliage. The galls of commerce are chiefly obtained from this species, through the puncture of a Cynips. A variety or closely allied species, Q. Lusitanica (Webb) or Q. Mirbeckii (Durieu) the Zéen-Oak, reaches a height of 120 feet, with a stem-girth of 20 feet. Some forms of this are almost evergreen, and then particularly eligible as promenade-trees.

Quercus lamellosa, Smith.*

From Nepal to Naga and Bootan, up to 10,000 feet. A magnificent oak, reaching a tallness of 120 feet; stem-girth to 30 feet. Acorns with cups to nearly 3 inches in diameter. Wood used for beams, posts, frames, rafters, not subject to warping. The bark serves well for tan. The tree enters prominently into forest-culture at Darjeeling [Gamble].

Quercus lancifolia, Roxburgh (not Chamisso nor Bentham).

A tall evergreen timber-tree of the Himalayas, extending to Upper Burmah. Wood valued for its durability, pale, hard; its medullary rays exceedingly fine [Sir D. Brandis].

Quercus lobata, Née.

Mexico and California. The Sacramento White Oak or "Roble." A tree finally about 150 feet high, with a stem to 6 feet in diameter, with wide-spreading branches, which often bend to the ground. Hardy in Middle Europe [C. Koch]. The wood is brittle when fresh, but hard and tough when seasoned; its value has been much underrated [Gibbons]. The acorns of this oak used to form a large proportion of the winter-food of the aboriginal inhabitants of North-California.

Quercus lyrata, Walter.

The Overcup-Oak of the South-Eastern States of North-America, extending from South-Illinois to Florida and Louisiana. A tree of majestic size, with a stem to 4 feet in diameter. Lately recommended as valuable for timber-cultivation, especially in wet ground.

Quercus macrocarpa, Michaux.

The Burr-Oak of Eastern North-America. Tree to about 70 feet high; stem-diameter sometimes 8 feet, Hardy at Christiania. Requires better soil than many other oaks. The timber regarded by some almost as good as that of the white oak; it is heavy, hard; strong and tough; in contact with soil it is one of the most durable among that of American oaks [B. E. Fernow]. Accounts from Canada are far less favorable to this wood. The bark contains about 8 per cent. tannin, Circumferential stem-measurement after 22 years' growth $3\frac{1}{2}$ feet in Nebraska [Furnas].

Quercus macrolepsis, Kotschy.*

Greece. This evergreen oak also yields Valonia, being closely allied to Q. Aegilops. A de Candolle unites with it Q. Græca of Kotschy.

Quercus magnolifolia, Née.

Mexico, in cooler mountain-regions, From Nee's note it would appear, that he saw on this oak the numerous caterpillars, which construct ovate cocoons eight inches long, consisting of a kind of grey silk, which was there locally manufactured into stockings and handkerchiefs.

Quercus Mongolica, Fischer.*

Manchuria and Northern China. It is on this tree and on Q. serrata and Q. dentata, that the silk-insect peculiar to oak-trees mainly is reared, as shown by Dr. Hance. Closely allied to this Q. Griffithi (J. Hooker and T. Thomson).

Quercus Muehlenbergii, Engelmann.

Middle and Eastern States of North-America. A middle-sized tree; its wood compact, strong, durable for posts and railway-ties [Sargent].

Quercus pachyphylla, Kurz.

The commonest Oak of Sikkim-Himalaya, at 7,000 — 10,000 feet. Acorns large, 3-seeded. A large evergreen tree. Wood extensively used for planking, palings, shingles and other requisites [Gamble].

Quercus palustris, Du Roi.

The Pin-Oak or Marsh-Oak of South-Eastern North-Amer Hardy at Christiania. Height at length 80 feet; of quick gro The wood is fine-grained, strong and tough; it is ornament furniture on account of the strong development of medullary

Quercus Phellos, Linné.

The Willow-Oak of the South-Eastern States of North-America. In low damp forest-land, attaining a stem-girth of 12 feet. The wood is hard, compact, very elastic, and suitable for railway-carriages and many other structures [Dr. C. Mohr]. The acorns available for food. A variety or closely allied species is the Shingle-Oak, Q. imbricaria (Michaux). The comparative value of the very numerous Cis- and Trans-Pacific oaks, little as yet understood in the rural world either for avenue-purposes or timber-plantations, should be tested with practical care. Even recently oaks have been discovered on the south-eastern mountains of New Guinea at not very high elevations.

Quercus Prinus, Linné.

The Swamp-Oak or Rock-Chestnut-Oak. South-Eastern States of North-America. A tree, becoming 90 feet high; aged stem as much as 15 feet in girth [Meehan]. Likes rocky hill-sides [Fernow]. The tree is hardy in Norway to lat. 59° 55′. Foliage deciduous. Wood strong and elastic, but more porous and of a coarser grain than that of the white oak; according to Porcher it is easy to split and not hard, used for building purposes, also cooperage. A red dye is produced from the bark; the latter is one of the most important among oak-bark for tanning, as it furnishes a very solid and durable leather.

Quercus reticulata, Humboldt.

Cooler regions of Mexico and Arizona. The wood approaches in quality that of the white oak [Pringle].

Quercus Robur, Linné.*

The British Oak. Extending through the greatest part of Europe, also to Western Asia, attaining a great age and an enormous size. It endures the frosts of Norway as far north as 65° 54′; while in lat. 59° 40′ a tree measured was 125 feet high and 25 feet in circumference of stem [Schuebeler]. Over 700 sound annual rings have been counted, and it has even been contended, that oaks have lived through 1,500 years. At Ditton's Park, owned by the Duke of Buccleugh, is an ancient oak, assumed to be 600 years old, with a stem-circumference of 30 feet at some distance (a few feet) from the ground [Dr. Masters and Th. Moore]. Two trees of the variety pedunculata, in Hesse, have a stem which 3 feet above the ground measures 37½ feet in circumference. The much and long admired Giant-Oak at the Unstrut (Germany), when felled at the age of 600 years, had the wood perfectly sound everywhere. The stem was 6 feet in diameter. Oaks have been known to gain a stem 12 feet in diameter at the base, 10 feet in the middle and 5 feet at the main-branches. At St. Vincent's Gulf the British Oak grew in 40 years to 66 feet in height [R. B. Smith]. Two varieties are distinguished: 1. Q. sessiliflora (Salisbury), the Durmast-Oak, with

a darker, heavier timber, more elastic, less fissile, easier to bend under steam. This tree is also the quicker of the two in growth, and lives in poorer soil. Its bark is richer in medicinal dyeing and tanning principles. 2. Q. pedunculata (Ehrhart). This variety supplies most of the oak-timber in Britain for ship-building, and is the best for many kinds of cabinet-makers' and joiners' work; most important also for staves. Saplings and branches in demand for walking sticks. In Britain the oak is sometimes attacked by Scolytus multistriatus. Extract of oak-bark for tanners' use fetches about £18 per ton in the London market; the best oak-bark yields 16 to 20 per cent. tannin. Hon. W. J. Winter noticed the British oak to withstand an occasional shade-temperature of 118 degrees F. in Riverina, New South Wales. The long-continued adherence of dead leaves in the cool and most verdant season renders this oak not so well adapted for pleasure-grounds in the warmer parts of the temperate zone as many others, particularly evergreen oaks. The English oak is however of quicker growth than many other species. At Port Phillip it attains as a maximum to a height of 40-50 feet in 20 years. The galls, produced by Cynips calicis, are sought for particular tanning, and called in Germany Knoppern. The best oak-bark for tanning is obtained from trees 12-36 years old [Prof. Wiesner]. A variety Q. pubescens (Willdenow) occurring in South-Europe, prefers calcareous soil. It is this particular oak, under the shade of which truffle-beds are chiefly established.

Quercus rubra, Linné.

The Red-Oak of Eastern North-America. Height reaching about 100 feet; diameter of stem 4 feet. A tree, content with poor soil, comparatively quick in growth. The wood, though coarse, is of rigidity, and has not the fault of warping; it is of fair value for staves [Simmonds], and even building purposes, but variable in quality according to soil and clime [Sargent]. The bark is rich in tannin. Autumnal tint of foliage beautifully red. The acorns, which are produced in great abundance, are relished by hogs. The tree is hardy still at Christiania. Circumferential stem-measurement at 2 feet from the ground after 22 years about 38 inches [Furnas].

Quercus semecarpifolia, Smith.

In the Himalayas and adjoining ranges up to about 12,000 feet. The largest of the oaks of India, upwards of 100 feet high, with a stem often 18 feet in girth. Leafless annually for a short time; not quick of growth. It furnishes a hard and heavy timber of fai quality. The leaves are locally stored for winter-forage. elaborate account of the nature of the wood and the increment growth is given by J. S Gamble for this and some other oak his manual of Indian timbers.

Quercus serrata, Thunberg.*

Japan, extending to China, Nepal and the Himalayas up to 5,000 feet. Hardy in Middle Europe. A good avenue-tree, though its foliage is deciduous. Supplies locally to a large extent the tan-bark [L. Boehme]. It yields the best food for the Oak-silkworm (Bombyx Yamamai). It is recommended to pack acorns intended for far distances in wooden cases between dry moss or sand, to secure retention of vitality; moreover they must be quite fresh, when packed.

Quercus sideroxyla, Humboldt.

Mountains of Mexico, up to about 8,000 feet elevation. An oak of great size; timber compact, almost imperishable in water. Q. lanceolata, Q. chrysophylla, Q. reticulata, Q. laurina, Q. obtusata, Q. crassipes, Q. glaucescens, Q. Xalapensis, Humb. and Q. acutifolia, Née, are among the many other highly important timber-oaks of the cooler regions of Mexico. No printed record seems extant, concerning the technology of the numerous Mexican oaks, though doubtless their respective values are well known to local artisans. According to the Abbé and Surgeon Liturgie, one of the American oaks, near San Juan, nourishes a Bombyx, the cocoons of which are spun by the natives into silk [Tschichatchef].

Quercus Skinneri, Bentham.*

Mexico. On limestone-soil, in the temperate region at 7,000-8,000 feet elevation. "Cozahual." Acquiring a height of 150 feet; thickness of stem to 12 feet. Wood yellowish, remarkably durable and elastic, not excelled in value by that of any other oak. Bark rich in tannin [Hugo Finck]. Foliage deciduous. The acorns of this oak measure nearly 6 inches in circumference, and are available for feeding various domestic animals.

Quercus spicata, Smith. (Q. squamata, Roxburgh).

From the Himalayas to Burmah and the Malayan Archipelagos, but not advancing to elevations above 5,000 feet. A large, evergreen Oak. Well fit for coppicing [Gamble]. Roxburgh already said of its timber, that it is paler than that of the British Oak, but seems fully as strong, durable, and also quite as close in the grain. It does not warp. For extensive information on the characteristics of the Indo-Malayan Oaks, refer to the superb illustrated volume, issued by Dr. King, from the Calcutta bot. Garden in 1889. He treats 82 well recognisable species.

Quercus stellata, Wangenheim. (*Q. obtusiloba,* Michaux).

The Post-Oak of North-Eastern America. Content with poor and even sandy soil, but not a large tree. Can be reared on sea-shores. On account of its very durable and dense wood it is much in requisition there for posts, and is particularly prized for ship-building, also sought for railroad-ties.

Quercus Suber, Linné.*

The Cork-Oak of South-Europe and North-Africa. It is evergreen and attains an age of fully two hundred years. Hardy in the lowlands of England, also at Arran. Does not exhaust the soil. After about twenty years it can be stripped of its bark every six or seven years; but the best cork is obtained from trees over forty years old. Height of the tree finally about 40 feet. Acorns of sweetish taste. Mr. W. Robinson found that young cork-oaks, obtained from the writer, made a growth of 4 feet yearly in the humid Western Port-district of Victoria. About 6,000 tons of cork-bark, at a value of £287,000, were exported merely from Algeria in 1878, and about the same in 1880, chiefly from private forests [Major F. Bailey]. The import of cork-bark during 1887 into Victoria was 37 tons, valued £1,432; of ready corks 242,647 lbs., valued at £23,313. The total value of manufactured and raw cork imported during 1886 into Britain was £644,182. It is calculated that 4,000 millions of corks are required annually now, for which we have no substitute. The bark of Q. pseudosuber (Santi) is inferor for cork, but the closely-allied Q. occidentalis (Gay), which is hardier than Q. Suber, produces also an excellent cork-bark.

Quercus Sundaica, Blume.

Java, Sumatra, Borneo, Penang, Perak, Malacca. Height to 100 feet, but not reaching high altitudes, and therefore perhaps shy to frost. The occurrence of oaks on the north-western mountains of New Guinea has been demonstrated by Dr. Beccari; several have been discovered also there in the British territory; hence, in all probability, additional valuable evergreen species will be obtainable thence for our arboreta and forests.

Quercus Tozæ, Bosc.

South-Europe. One of the handsomest oaks, and one of the quickest in growth. Will live in sandy soil and emits suckers. It furnishes superior tanners' bark.

Quercus undulata, Torrey.

From California and Arizona to the Rocky Mountains. The acorns are sweet and edible. Q. Gambelii (Nuttall) is an allied but distinct species [Prof. Green].

Quercus virens, Linné.*

The Live-Oak of North-America, extending northward only to Virginia, occurring also in Mexico. One of the hardiest of the evergreen species. and among congeners in the United States t quickest in growth [Fernow]. Likes a coast-climate and a soil r in mould. Becomes 60 feet high, with a stem sometimes to 9 f in diameter. Supplies a most valuable timber for ship-build it is heavy, compact, fine-grained; it is moreover the strongest

most durable yielded by any American oaks. Like Q. stellata, it lives also on sea-shores, helping to bind the sand, but it is then not of tall stature. Q. Virginiana (Miller) is the oldest name for this oak, as pointed out by C. Koch. Of many of the 300 oaks, occurring in the western and eastern portions of the northern hemisphere, the properties remain unrecorded and perhaps unexamined; but it would be important to introduce as many kinds as possible for local test-growth.

Quercus varlifolia, Hance.

China. A magnificent Oak. The acorns serve locally for human food.

Quercus Wislizenii, A. de Candolle.

California, at an elevation of about 7,000 feet, extending to Shasta. Allied to Q. agrifolia. A magnificent tree with dense foliage, the stem attaining finally a circumference of 18 feet [Prof. Sargent]. Wood hard, tough and durable [Prof. Green].

Quercus Xalapensis, Humboldt and Bonpland.

Mexico, ascending to 5,000 feet, preferring for localities poor soil, but of ferruginous clay, where little else will grow. Height to 80 feet; it is a quick grower; its timber will endure only under roof; the tree gives a heavy crop of acorns [Hugo Fink]. The nearly allied Q. commutata attains 70 feet and ascends to 11,000 feet [Liebmann].

Quillaja saponaria, Molina.

Chili. A colossal tree, fit not only for loamy but also sandy and peaty soil. The bark is rich in saponin, and therefore valuable for dressing wool and silk, also for various cleansing processes. Kageneckia oblonga (Ruiz and Pavon) is allied, and from the same country, extending to Peru, and provides locally tan-bark [Dr. J. A. de los Rios].

Rafnia amplexicaulis, Thunberg.

South-Africa. The root of this bush is sweet like liquorice, and is administered in medicine. Rafnia perfoliata (E. Meyer), also from South-Africa, furnishes likewise a medicinal root.

Raphanus sativus, Linné.

The Radish. Temperate Asia, southward to the Himalyas up to 16,000 feet, eastward to Japan. Cultivated already by the ancient Romans and Greeks. Ripens seeds quite well even in the hot desert-tracts of Central Australia. Can in mild climes be grown all the year round. In Norway it can be raised northward to lat 70° 20′ [Prof. Schuebeler]. R. caudatus, L., the radish with long edible pods, which exceptionally grow to a length of three or

four feet [J. R. Jackson], is regarded by Dr. Th. Anderson as a mere variety, and he thinks, that all have sprung from the ordinary R. Raphanistrum, L., of Europe. Indeed, R. maritimus seem also a primitive form of the coast, with a root of fine quality and great pungency [Chambers.] All radishes succeed best in a calcareous soil, or their culture must be aided by manure rich in lime. The root of the black radish is comparatively rich in starch. The seeds, according to Vilmorin, will keep about five years.

Remirea maritima, Aublet.

Intra-tropical coast-regions around the globe. A perennial creeping sedge for binding sand. Hardy a considerable distance beyond the tropics.

Reseda Luteola, Linné.

The Weld. Middle and Southern Europe, Middle Asia, North-Africa. An herb of one or two years' duration. Likes calcareous soil. A yellow dye (luteolin) pervades the whole plant. The plant must be cut before the fruit commences to develop, otherwise the pigment will much diminish.

Reseda odorata, Linné.

The true Mignonette. North-Africa and Syria. A favorite garden-herb of one or very few years' duration. Ripens in West-Europe; seeds still in lat. 69° 18′. About 40,000 lbs. are annually gathered at Grasse for distillation, the price being about 10d. a lb. The delicate long enduring scent can be concentrated and removed by enfleurage, or better still in Blogg's process by methyl chloride, fixed as so-called "concrete oil." To be counted also among the honey-plants. Mess. Dippe in Quedlinburg devote regularly about 50 acres to rearing of mignonette-seeds.

Rhagodia Billardieri, R. Brown.

Extra-tropical Australia. An important bush for binding moving sands on sea-shores. Resists the severest gales as well as the spray of the sea. Browsed on by pastoral animals.

Rhagodia nutans, R. Brown.

Southern, Eastern and Central Australia. This is a good fodder-herb for saltbush-runs. R. linifolia is similarly important [Alex. Hamilton]. Further may be mentioned R. spinescens (R. Brown), the spineless variety of which is greedily eaten by horses, cattle and sheep, according to Mrs. Biddulph. The rather tall and bu R. hastata (R. Br.) is equally valuable [Rev. Dr. Woolls]. W. A. Dixon found the proportion of saline substance in this pl very large. Several other species deserve attention. Some c species, mostly shrubby, are equally valuable.

Rhamnus Alaternus, Linné.

Countries round the Mediterranean Sea. A hedge-shrub, becoming arborescent, thus gaining a height of 20 feet. It strikes readily from cuttings. G. Don admits it as a splendid honey-plant.

Rhamnus alnifolius. L'Héritier. (*R. Purshianus*, D.C.)

From California to Oregon and British Columbia. Allied to R. Carolinianus (Walter). Reaches a height of about 20 feet. Leaves deciduous. This species furnishes as "Cascara Sagrada" its bark, famed for cathartic properties; about 300,000 lbs. are at present annually used therapeutically; the fruits are also powerfully aperient. R. Californica (Chamisso) acts similarly, according to Dr. J. G. Steele. R. crocea (Nuttall) has also some medicinal virtue.

Rhamnus catharticus, C. Bauhin.

The Buckthorn. Middle and Southern Europe, North-Africa, Middle Asia. It can be utilised as a hedge-plant. The berries are of medicinal value, as indicated by the specific name. The foliage and bark can be employed for the preparation of a yellow and green dye; the juice of the fruit mixed with alum constitutes the "sap-green" of painters. The plant is hardy in Norway to lat. 60° 48′. R. Dahuricus (Pallas) is a closely cognate species.

Rhamnus chlorophorus, Lindley.

China. From the bark a superior green pigment is prepared. R. utilis, from the same country, serves for the like purpose. This kind of dye is particularly used for silk, and is known as Lokao.

Rhamnus Frangula, Linné.

Europe, North-Africa, Northern and Western Asia. Endures the climate of Norway to lat. 64° 30′ [Schuebeler], A tall shrub with deciduous leaves. The flowers are particularly grateful to bees [G. Don]. The wood one of the very best for gunpowder. Recommended by Sir Joseph Hooker to be grown on the coppice-system for this purpose. The bark is valuable as a cathartic; yields also a yellow dye. R. purpureus (Edgeworth) is an allied Himalayan species.

Rhamnus Græcus, Reuter.

Greece. From this shrub and to no less extent from the allied R. prunifolius (Sibthorp) are derived the green dye-berries collected in Greece, according to Dr. Heldreich. These shrubs grow on stony mountains up to 2,500 feet.

Rhamnus infectorius, Linné.

On the Mediterranean Sea and in the countries near to it. Hardy still at Christiania. The berry-like fruits of this shrub are known in commerce as Graines d'Avignon and Graines de Perse, and pro-

duce a valuable dye, green or yellow, according to treatment. Other species seem to supply a similar dye-material; for instance, R. saxatilis, L., R. amygdalinus, Desf., R. oleoides, L.. R. tinctorius, W. and K., all from the regions at and near the Mediterranean Sea.

Rhapidophyllum Hystrix, Wendland and Drude. (*Chamærops Hystrix*, Fraser.)

The Blue Palmetto of Florida and Carolina. A hardy dwarf Fan-palm.

Rhapis flabelliformis, Linné fil.

China and Japan. This exceedingly slender palm attains a height of only a few feet. The stems can be used for various small implements. It is one of the best plants for table-decorations. It bears the climate of the South of France to 40° 32′ N. lat. [Naudin].

Rhaponticum acaule, De Candolle.

On the Mediterranean Sea. A perrenial herb. The root is edible.

Rheum australe, D. Don.* (*R. Emodi*, Wallich; *R. Webbianum*, Royle.)

Himalayan regions up to 16,000 feet. From this species at least a portion of the medicinal Rhubarb is obtained, its quality depending much on the climatic region and the geological formation, in which the plant grows. Should we wish to cultivate any species here for superior medicinal roots, localities in our higher and drier alpine tracts should clearly be chosen for the purpose. Hayne regards the presence of much yellowish pigment in the seed-shell as indicating a good medicinal rhubarb-plant. As much as 5 lbs. of the dried drug are obtainable from a single plant several years old. An important orange-red crystalline substance, emodin, allied to chrysophanic acid, occurs in genuine rhubarb. Medicinal rhubarb-root is now also grown in England. The Himalayan R. Moorcroftianum (Royle) yields also a purgative root.

Rheum officinale, Baillon.*

Western China and Eastern Thibet on the high table-land. Height of stem sometimes to 10 feet; circumference of foliage reaching 30 feet; blade of leaf 2 feet long and broad [Balfour] It furnishes most of the true Turkey-Rhubarb, not merely from t root but also from the woody stem. Suited for mountain regions. Recommended also as a scenic plant by Regel. H still at Christiania.

Rheum palmatum, Linné.*

From insular to alpine North-Eastern Asia. Attains a height of 9 feet. A variety from the Tangut-country of Mongolia or North-Thibet, found by Col. Przevalski, yields an excellent medicinal root, known as the Kiakhta- or Khansu-Rhubarb (Maximowicz)—indeed the best Russian Rhubarb. Cultivation of this variety in Germany on sandy moor-ground developed in the root to a large extent the chrysophanic acid and emodin [Prof. Beilstein]. The plant is valuable also for decorative effect. For medicinal culture alpine valleys with soil rich in lime are needed [Sir Rob. Christison]. For indications of the literature on medicinal rhubarbs see among lexicographic works particularly B. D. Jackson's *Vegetable Technology*, London Index-Society, 1882.

Rheum Rhaponticum, Linné.

From the Volga to Central Asia. This species, together with R. Tataricum, L. fil., R. undulatum, L., and a few others, all Asiatic (one extending to Japan), provide in their acidulous leaf-stalks and unexpanded flower-mass for culinary purposes the ordinary Rhubarb, also known as "Rhapontic." Rhubarb-leaves can also be used in the manner of spinage. In tropical climes this culinary vegetable is available only during the cool season. Propagation generally by division of root. The soil for rhubarb-plants, intended to yield kitchen-vegetable, must be deep and rich.

Rheum Ribes, Gronovius.

Palestine, Persia, Beloochistan, from 3,000 feet upwards, on wet clay-soil. The native inhabitants are very fond of the young flowering shoots as food. Foliage scarlet in autumn [Dr. J. Aitchison].

Rhizopogon magnatum, Corda.

Europe. One of the edible truffles sold in the markets of Middle Europe, with R. rubescens (Tulasne).

Rhododendron maximum, Linné.

North-Eastern America. Attains a height of about 20 feet. Irrespective of its being a fine acquisition for any garden-copses, this bush seems of industrial importance, because Mr. C. Forster asserts, that the wood of this and the allied Kalmia latifolia, L., is surpassed only by the best boxwood. This may give a clue to other substitutes for that scarce commodity, needed so extensively by the wood-engraver.

Rhus aromatica, Aiton.

North-America, from the Atlantic to the Pacific Ocean, northward to Canada. A straggling bush. The aromatic foliage important for medicinal purposes.

Rhus caustica, Hooker and Arnott. (*Lithræa venenosa*, Miers.)

Chili, where it is called the Litre. A small or middle-sized tree, the very hard wood of which is used for wheel-teeth, axletrees and select furniture. The plant seems neither caustic nor otherwise poisonous [Dr. Phillippi].

Rhus copallina, Linné.

Eastern North-America, extending to Canada. A comparatively dwarf species. This can be used for tanning. A resin for varnishes is also obtained from this shrub.

Rhus coriaria, Dodoens.*

The Tanner's Sumach. Countries around the Mediterranean Sea, extending to temperate Western Asia. The foliage of this shrub or small tree, simply dried and reduced to powder, forms the sumach of commerce. It is remarkably rich in tannic acid, yielding as much as 30 per cent., and is extensively used for the production of a superior Corduan- or Maroquin-leather and pale-colored leathers and dress-goods. Sumach allows the leather to carry more grease [Ballinent]. Price in Melbourne £15 to £30 per ton. It thrives best in loose calcareous soils, and cannot endure stagnant water. The strongest sumach is produced on dry ground. The cultivation presents no difficulty. With us it has thriven well even on the dry plains of the Wimmera-district. A gathering can be obtained from suckers in the first year. The duration of sumach-fields under manure extends to fifteen years. Sumach can also be used for ink and various, particularly black dyes. Under favorable circumstances as much as a ton of sumach is obtained from an acre. Sumach from Melbourne-plants was shown already at the Exhibition of 1863. During 1889 the import into Britain was 12,514 tons, valued £140,517.

Rhus cotinoides, Nuttall.

Arkansas and Alabama. A tree, rising to 40 feet. The inner bark and the wood valuable for yielding a yellow dye [C. Mohr].

Rhus cotinus, Linné.* (*Cotinus coggyria,* Scopoli.)

The Scotino. In the countries on the Mediterranean Sea, extending to Hungary and to the Himalayas. The wood of this bush furnishes a yellow pigment. The Scotino, so valuable material for yellow and black dye, and as a superior tanning stance, consists merely of the ground foliage of this plant. J tains up to 24 per cent. tannin. The plant endures the Nor winters northward to lat. 67° 56′ [Prof. Schuebeler].

Rhus glabra, Linné.

North-America, extending to 54° north latitude; in Norway hardy to lat 58° 8′. This sumach-shrub will grow on rocky and sterile soil. It produces a kind of gall, and can also be used as a substitute for the ordinary sumach. Employed also for therapeutic purposes. This species can be easily multiplied from suckers. It is rich in the quality and long-lasting yield of honey from its flowers [Quinby]. American sumachs contain generally from 15 to 20 per cent. or occasionally up to 26 per cent. tannin. On value of American Sumachs see Special Report No. 26, U.S. Department of Agriculture, 1880.

Rhus lucida, Linné.

South-Africa. This shrub proved in Victoria of peculiar adaptability for forming hedges; it is evergreen, close-growing, and stands clipping well. About half a hundred South-African species are known, of which probably some could be utilised like ordinary sumach; but hitherto we have remained unacquainted with the nature and degree of any of their tanning and coloring principles.

Rhus rhodanthema, F. v. Mueller.

East-Australia, on river-banks. A tree finally to 70 feet high; stem often 2 feet in diameter. Wood dark-yellow, soft, fine-grained, beautifully marked, much esteemed for cabinet-work. Worth £5 to £6 per 1,000 feet in Brisbane [W. Hill].

Rhus semialata, Murray.

China and Japan, extending to the Himalayas. Attains a height of 40 feet. This species produces a kind of nutgalls, the tan-principle of which ranges from 69 to 77 per cent. It is apt to spread beyond ready control in rich soil. The stem will finally reach the thickness of a foot or more; the wood is tough and durable but stringy, prettily marked with dark edging.

Rhus succedanea, Linné.

The Wax-tree of Japan, extending to China and the Himalayas, there up to 8,000 feet. Valuable for scenic effect through its autumnal tint. The produce of this tree has found its way into the English market. The crushed berries are steamed and pressed, furnishing about 15 per cent. of wax, which consists mainly of palmatin and palmitic acid. Rhus silvestris (Siebold & Zuccarini) and R. vernicifera yield there a similar wax.

Rhus typhina, Linné.

The Staghorn-Sumach. Eastern North-America, extending to Canada. Hardy in Norway to lat. 61° 17′. This species will become a tree of about 30 feet height. Its wood is of orange tinge. Through incisions into the bark a kind of copal is obtained. The

leaves may be used like ordinary sumach. This bush can be reared on inferior land. The leaves of American sumachs must be collected early in the season, if a clear white leather like that from Sicilian sumach is to be obtained. This can be ascertained by the color of the precipitate effected with gelatine. Some of the American and also other sumachs are important to apiarists.

Rhus vernicifera, De Candolle.

Extends from Nepal to Japan. It forms a tree of fair size and yields the Japan-varnish. In India it ascends to 7,000 feet; but Stewart and Brandis are doubtful, whether the Japanese species (R. Vernix L.) is really identical with the Indian. The fruit yields vegetable wax. R. Wallichii (J. Hooker) of the Himalayas is a cognate species.

Ribes aureum, Pursh.

From Arkansas, Missouri, Oregon to Canada. Endures the cold of Norway to lat. 70° [Schuebeler]. This favorite bush of garden-shrubberies would probably along forest-streams produce its pleasant berries, which turn from yellow to brown or black. Its showy flowers are among the earliest in the spring. Professor Meehan mentions a variety or allied species from Utah, with berries larger than those of the black-currant; they are quite a good table-fruit, and of all shades from orange to black, and this variety remains constant from seeds. Allied to this is R. tenuiflorum (Lindley) of California and the adjoining States, with fruits of the size of red currants, of agreeable flavor and either dark-purple or yellow color. R. aureum, R. palmatum and some other strong American species have come into use as stocks, on which to graft the European gooseberry [C. Pohl].

Ribes Cynosbati, Linné.

The prickly fruited Gooseberry-bush of Canada and the Eastern States of the American Union. The berries are large. There is a variety not so objectionably burrlike-prickly. R. Cynosbati has been hybridized with R. Grossularia, and the sequence has been a good result [Saunders].

Ribes divaricatum, Douglas.

California and Oregon. One of the gooseberry-bushes of those countries. Can be grown in Norway to lat 69° 40.′ Berries smooth black, about one-third of an inch in diameter, pleasant to the tas Culture might improve this and many of the other species. Nuttalli (R. villosum, Nuttall, not of Gay nor of Wallich) is allied plant, also from California.

Ribes floridum, L'Héritier.

The black Currant-bush of North-Eastern America. The berries resemble in odor and taste those of R. nigrum. Allied to this is R. Hudsonianum (Richardson) from the colder parts of North-America.

Ribes Griffithi, J. Hooker and T. Thomson.

Himalaya, at heights from 10,000 to 13,000 feet. Allied to R. rubrum, bearing similar but larger berries of somewhat austere taste. R. laciniatum (H. & T.) is likewise a Himalayan species with red berries, and so is R, glaciale (Wallich). Furthermore, R. villosum, Wall. (R. leptostachyum, Decaisne), comes from the Indian highlands and seems worthy of practical notice. Dr. A. von Regel (Garten-Flora, 1884) speaks of the red berries of a Spugnanic Ribes, which after the first frost get quite an aromatic taste.

Ribes Grossularia, Linné.*

The ordinary Gooseberry-bush. Europe, North-Africa, extra-tropical Asia, extending to the Chinese boundary [Regel], on the Himalayan mountains up to a height of 12,000 feet; in Norway enduring the cold to lat. 69° 30′. This plant, familiar to everyone, is mentioned here mainly to indicate the desirability of naturalising it in any sub-alpine regions, where it is not indigenous already. On the upper Mitchell-River, in subalpine elevations of about 4,000 feet, gooseberries 1⅜ inch in diameter have been reared on silurian soil [R. Travers]. In near proximity on the high plains of Dargo, at about 4,600 feet, this fruit developed also luxuriantly [J. Stirling]. Also a honey-yielder. Use of the fruit for preserves now very extensive. Shelton recommends for this purpose boiling for eight minutes and the use of ½ lb. sugar for every quart of water. The hybridising of closely allied species may bring about new enlarged or otherwise improved sorts of fruits, as in the case of strawberries.

Ribes nigrum, Linné.*

The Black Currant-bush. Europe, Middle and Northern Asia, North-America, ascending the Himalayan and Thibetan mountains to a height of about 12,000 feet; also particularly fit to be dispersed through forests in elevated situations. Hardy in Norway to lat. 69° 30′. In the warmer zones a plant of mountain-regions. Particularly large fruits developed in the Australian Alps fully up to 4,600 feet elevation [J. Stirling]; the culture or naturalisation likely up to 6000 feet possible there. Best use of the fruit for jellies and other kinds of preserves.

Ribes niveum, Lindley.

One of the Oregon Gooseberry-bushes. Berries small, black, of a somewhat acid taste and rich vinous flavor. Hardy to lat. 67° 56′ in Norway.

Ribes orientale, Desfontaines.

From Syria to Afghanistan, up to an elevation of about 11,000 feet. The leaves emit a pleasant perfume [C. Koch]. The berries act as a powerful purgative [Dr. Aitchison].

Ribes oxyacanthoides, Linné. (*R. hirtellum,* Michaux.)

North-America, particularly in the New England-States, extending to Canada, Hudson's Bay and New Mexico, ascending the Californian mountains to 9,000 feet. The Currant-Gooseberry. It likes moist ground. Yields the commonest smooth gooseberry there. Fruit of good size, its pulp sweetish [Sir J. Hooker].

Ribes rotundifolium, Michaux.*

Eastern North-America, as far as Canada. Hardy northward to 69° 30′ in Norway. Yields part of the smooth gooseberries of the United States. The fruit is small, but of delicious taste. Unlike the ordinary gooseberry, not subject to mildew. Careful cultivation has gradually advanced the size of the fruit [Meehan].

Ribes rubrum, Linné.*

The ordinary Red Currant-bush. Europe, North-America, Northern and Middle Asia, in the Himalayan mountains ceasing where R. Griffithi commences to appear. One of the best fruit-plants for jellies and preserves, that can be chosen for colder mountain-altitudes. It endures the climate of Norway to lat. 70° 30′ [Prof. Schuebeler]. Near Mount St. Bernard, in the Australian Alps, on sources of the Ovens-River the growth of Red Currants, Parsnips, Cabbages, Radishes, Beet and other hardy fruits and vegetables has been particularly quick, after the winter rest of the soil under snow. The root-bark contains phlorrhizin. During its short flowering time much sought by bees, the honey thus obtained excellent. Perhaps other species than those recorded here, among them some from the Andes, may yet deserve introduction, irrespective of showiness, for their fruits. See also an extensive treatise on cider from Red Currants by H. Timm, in Cappeln.

Richardia Africana, Kunth. (*R. Aethiopica,* Rosenthal.)

The "Calla" of gardens. From the Nile to the Cape of Good Hope. Important for scenic effects, particularly on the margins of waters. Easily moved at all seasons. The fresh root contains about 2 per cent. of starch.

Richardsonia scabra, Kunth.

From Mexico to Brazil. As an herb for pastures and hay-crop appreciated in localities with sandy soil [C. Mohr]. It has spread over the Southern States of North-America.

Ricinus communis, Linné.*

The Castor-Oil Plant. Spontaneous in the tropical and sub-tropical zones of Asia and Africa, but hardly in South-Europe, originating according to A. de Candolle in North-Eastern Africa. A shrubby, decorative plant, attaining the size of a small tree. At Christiania it grew to 12 feet in height and bore fruit, and it is reared as a summer-plant even to lat. 68° 7′ [Prof. Schuebeler]. It was well known to Egyptians four thousand years ago, and is also mentioned in the writings of Herodotus, Hippocrates, Dioscorides, Theophrastos, Plinius and other ancient physicians, philosophers and naturalists. The easy and rapid growth, the copious seeding and the early return of produce render this important plant of high value in the warm temperate zone, more particularly as it will thrive on almost any soil, and can thus be raised even on arid places, without being scorched by hot winds. Recently recommended for staying bush-fires and for keeping off locusts and other noxious insects and blights from plantations; also available for some dye-processes. In warm climes this plant may spread beyond control, and may then become hurtful to pastoral interests; but it may become an important plant also for culture in desert-tract, and is evidently destined to be in countries with cheap labor one of the most eligible plants to furnish oil for technical uses, particularly for lubricating machinery, irrespective of the value of its oil for medicinal purposes. Oil used also for dressing some kinds of leather. The scalded leaves, applied externally, have long been known as a powerful galactagogue; the foliage is also in use as an emmenagogue; the root-bark has purgative properties. The seeds yield about 25 per cent. oil, when pressed without application of heat. To obtain the best medicinal oil, hydraulic pressure should be employed, and the seeds not be subjected to heat; the seed-coat should also be removed prior to the extracting process being proceeded with. A screw-press suffices however to obtain the oil for ordinary supplies. By decantation and some process of filtration it is purified, but it should never be long exposed to air and light. For obtaining oil, to be used for lubricating of machinery or other technological purposes, the seeds may be pressed and prepared by various methods under application of heat and access of water. For lubrication it is one of the most extensively used of all oils. Castor-oil dissolves completely in waterless alcohol and in ether, and will become dissolved also in spirit of high strength, to the extent of three-fifths of the weight of the latter. Solutions of this kind may become valuable for various technical purposes, and afford some test for the pureness of the oil. If pressed under heat it will deposit margaritin. Heated in a retort about one-third of the oil will distil over, and a substance resembling india-rubber remains, which saponizes with alkalies. Other educts are at the same time obtained, which will probably become of industrial value. These facts are briefly mentioned here merely to explain, that the value of this easily produced oil is far more varied than is generally

supposed; and this remark applies with equal force to many other chemical compounds from vegetable sources, briefly alluded to in this present enumerative treatise. The seeds contain also a peculiar alkaloid—ricinin. The solid chemical compound of castor-oil is the crystalline isocetic acid (a glycerid). The oil contains also a non-crystalline acid, peculiar to it (ricinoleic acid). For the production of a particular kind of silk the Ricinus-plant is also important, inasmuch as the hardy Bombyx Arrindi requires the leaves of this bush for food. Pastoral animals must strenuously be kept away from the Ricinus. Even a few of the seeds, if swallowed, will produce poisonous effects. The import of castor-oil in 1886 into Britain was 175,813 cwt., worth £244,675. Into Victoria were during 1887 imported medicinal oil to the value of £3,710, and lubrication-oil worth £33,883. In the *Chemist and Druggist* it is stated, that Britain latterly used 900,000 gallons a year, worth crudely £160,000. In countries with a high labor-rate the competition with India also as regards the castor-oil industry will be difficult. But if ruralists can be induced, to rear the plant extensively and to offer the seeds cheaply, manufacturers would readily set up oil-mills.

Robinia Pseudacacia, Linné.

The North-American Locust-Acacia, ranging from Alleghany to Arkansas. Height reaching 90 feet. Hardy to lat. 63° 26′ in Norway. The hard and durable wood is in use for a variety of purposes, and particularly eligible for treenails, axletrees and turnery; strength greater than that of the British oak, weight lighter [D. J. Browne]. The natives used the wood for their bows. The tree is of rapid growth, and attains an age of several hundred years. A tree raised in 1635, in the Paris Jardin des Plantes, is still alive. It may be planted closely for timber-belts and hedge-shelter on farm-lands. It is one of the best trees for renovating exhausted land and for improving poor soil. Also a bee-plant. Recommended as one of the easiest grown of all trees on bare sand, though standing in need of twice as much mineral aliment as Pinus silvestris and nearly as much as poplars. It pushes through shifting sand its spreading roots, which may attain a length of seventy feet. It will maintain its hold in hollows of drifts, where even poplars fail [Wessely]. The roots are poisonous. The allied R. viscosa (Ventenat) attains a height of 40 feet.

Roccella tinctoria, De Candolle.

Canary-Islands, Azores, also in Western and Southern Europe and North-Africa. This lichen furnishes the litmus, orseille or orchil for dyes and chemical tests. It is a question of interest whether it could be translocated and naturalised on the cliffs of our shores also. Other dye-lichens might perhaps still more easily

naturalised; for instance, Lecanora tartarea, L. parella, Pertusaria communis, Parmelia sordida, Isidium corallinum and some others, which furnish the Cudbear or Persio.

Rosa alba, Linné.

Europe, Western Asia. Can be held specifically apart from R. canina. According to recent researches of Dr. G. Dieck, at Merseburg, a scented variety of this species serves also for oil-distillation at the Balkan. Roses for Attar should only be just unfolding, should be collected at the earliest morning-hours, and at once submitted to distillation. Of the white and damascene Rose, the calyx is left with the petals. [Dr. Dieck]. Mr. Schimmel's fields of oil-roses near Leipzig, commenced in 1884, for steam-distillation of rose-oil, cover now about 120 acres, furnishing annually 175,000 to 220,000 lbs. of roses, which yield from 25 to 45 lbs. pure oil. This is now sent out free of stearopten, therefore always in a liquid state at ordinary temperatures, such oil being of most concentrated scent, superior to any hitherto purchasable. The particular rose-plants, fit for oil-production, come well through the hard and protracted winters of Saxony. The price of Turkish rose-oil ranges generally from £15 to £16 per pound.

Rosa canina, Linné.

The "Dog-Rose," Europe, Northern and Middle Asia, North-Africa. Furnishes one of the best stocks, on which hybrid Roses can be budded. This species attains a very great age; the famed and sacred rose at the cathedral of Hildesheim existed before that edifice was built, therefore before the ninth century [Langethal]. It is the "Rose-tree of thousand years age;" it is regarded with undiminished veneration still at the present day, and continues to flourish. Historic records prove as well as legends and tradition, that in 815 the Emperor Ludwig, the son of Charles the Great, caused the partly still existing chapel to be built in commemoration of an event connected with this identical plant. [Heuzenroeder]. Mr. Niemann of Petersburg recommends for stock a rose which is according to Dr. Regel R. cinnamomea (Linné), while Mr. O. Froebel, of Zuerich, has lately lauded for this purpose a rose, which probably is R. canina var. caucasica. Mr. Th. Nietner, of Potsdam, has just issued an index of 5,000 kinds of Garden-Roses.

Rosa centifolia, Linné.*

The Cabbage-Rose, Moss-Rose, Provence-Rose. Indigenous on the Caucasus and seemingly also in other parts of the Orient, or originated rather as a garden-form from Rosa Gallica [Regel, Crepin]. It will endure the frosts of Norway as far north as lat. 70° [Schuebeler]. Much grown in South-Europe and Southern Asia for the distillation of rose-water and oil or attar of roses. The variety R. provincialis (Aiton) is especially esteemed. No pruning is resorted to, only the dead branches are removed; the

harvest of flowers is from the middle of May till nearly the middle of June; the gathering takes place before sunrise [Simmonds]. From 12,000 to 16,000 roses, or from 250 lbs. to 300 lbs. of rose petals, are required according to some calculations for producing a single ounce of attar through ordinary distillation. The flowers require to be cut just before expansion; the calyx is separated and rejected; the remaining portions of the flowers are then subjected to aqueous distillation, and the saturated rose-water so obtained is repeatedly used for renewed distillation, when on any cold place the oil separates from the overcharged water and floats on the surface, whence it can be collected after refrigeration by fine birds' feathers. Rose-oil consists of a hydro-carbon stearopten, which is scentless, and an elaeopten, which is the fragrant principle. But some other methods exist for producing the oil; for instance, it may be got by distilling the rosebuds without water at the heat of a water-bath, or by merely passing steam through the still. The odor may also be withdrawn by alcoholic distillation from the roses or be extracted by the "enfleurage" process. The latter is effected by placing the flowers, collected while the weather is warm, into shallow frames covered with a glass-plate, on the inner side of which a pure fatty substance has been thinly spread. The scent of the flowers is absorbed by the adipose or oleous substance, though the blossoms do not come in direct contact with it; fresh flowers are supplied daily for weeks. The scent is finally withdrawn from its matrix by maceration with pure alcohol. Purified eucalyptus-oil can be used for diluting rose-oil, when it is required for the preparation of scented soap. The essential oil of orange-peel might similarly be employed as a vehicle. The *Revue Agricole* lately stated, that from various kinds of Roses about 30 millions lbs. of flowers are annually gathered for oil-distillation in Southern France, the price being 2d. to 2½d. a lb.

Rosa Damascena, Miller.*

Orient. Allied to the preceding and the following species, also largely used for the production of essential oil of roses. The particular varieties used in Turkey are called by Dr. Dieck trigintipetala and Byzantina; the latter grows easily from cuttings and produces long shoots, the former is flowering still richer even in Germany, both have through him become articles of horticultural commerce. Prof. Crépin reduces R. Damascena to R. Gallica. According to Dr. G. Dieck R. alba (Linné) is also a variety of this or a hybrid with R. canina, the latter prevailing, and it is this white-flowered rose which largely furnishes the oil at Kezanlik. The annual time of flowering extends over several months.

Rosa Gallica, Linné.

The French or Dutch Rose. Middle and Southern Eur South-Western Asia. Hardy to lat. 70° in Norway. The inte

colored flower-buds of this species are particularly chosen for drying, the calyx removed. These however may be got also from other kinds of roses.

Rosa Indica, Linné. (*R. Sinica,* Linné.; *R. Chinensis,* Jacquin.)

China, thence brought to India. Can be cultivated in the open air of Western Europe to lat. 67° 86′ [Schuebeler]. The "Hybrid Perpetuals" are largely traceable to this plant. Flowering time of long duration annually. Some roses of the sweetest scent are derived from this species. R. fragrans (Redouté), the Tea-Rose, is a variety. The Noisette-Rose is a cross of this and R. moschata. How amazingly lucrative sometimes the growth of ornamental Roses may become, has lately been exemplified by the "Five Thousand Dollars Rose," a cross between the variety "President" and Rose Xavier Olibo, reared by Mr. F. W. Bennett, of Stapleford. Attention is drawn by Mr. R. Brandt to the quick growth and very early flowering of the Bennett-Rose, also to the stability of the flowers.

Rosa lævigata, Michaux. (*R. Sinica,* Murray, not of Linné.)

The Cherokee-Rose. China and Japan. Considered one of the best hedge-roses, and for that purpose much employed in North-America, It serves well also for bowers. Allied to the foregoing species.—The lovely garden-favorite, R. Banksiæ (R. Brown), also indigenous to China and perhaps Japan, is one of the best for arbours and for covering walls.

Rosa moschata, Miller.*

North-Africa and South-Asia, ascending the Indian and Abyssinian mountains to 11,000 feet. Blooming all the year round in warm climes, but more profusely in the cool season. From the flowers of this extremely tall climbing species also essential oil is obtained. The attar thus derived from roses of not only different varities, but even distinct species, must necessarily be of various quality. In the Balkan-mountains, on basalt-slopes facing south, the most odorous roses are produced. At Kezanlik rose-distillation is the main-industry. Shoots of rose-bushes are placed in trenches 3 feet deep and 5 feet apart. Irrigation promotes the growth. The gathering commences in the third and lasts till about the fifteenth year [Simmonds]. The pure oil as a European commodity is worth from £20 to £23 per pound. This is also the rose, according to Schlagintweit, used for attar-distillation in Tunis. Pure attar, valued at 30 shillings per ounce, is produced in Roumelia to the amount of £80,000 annually [Piesse].

Rosa rugosa, Thunberg.

Japan and Kamtschatka, there thriving even in coast-sand. Bears the most severe of frost; forms copious suckers for multiplication. The pleniflorous variety also of this Rose serves for scent-distillation [M. Wobst].

Rosa sancta, A. Richard.

Abyssinia. With R. Abyssinica (R. Brown) the most southern of all Rose-species. Seems entitled to record here, as it is still cultivated at temples. Prof. Crépin has identified flowers from ancient Egyptian tombs with this Rose, which must therefore have some special value.

Rosa sempervirens, Linné.

From South-Europe through Southern Asia to Japan. Hardy still at Christiania. One of the best rose-bushes for covering walls, fences and similar structures. The flowers of this species also can be utilised for rose-oil.

Rosa setigera, Michaux.

North-Eastern America, where it is the only climbing rose-bush. It deserves introduction on account of its extremely rapid growth —10 to 20 feet in a season. Its flowers however are nearly inodorous. Other original species of roses are worthy of our attention, Sir Joseph Hooker admitting about thirty, all from the northern hemisphere. But on the snow-clad unascended mountains of New Guinea and Africa south of the equator, perhaps new roses may yet be discovered, as they have been traced southward to Abyssinia already.

Rosa spinosissima, Linné.

Europe, North-Africa, Middle and Northern Asia. The Burnet-Rose. Adapted for holding coast-sands: unapproachable to pasture-animals, and not spreading into culture-land or pastures like the sweetbriar, R. rubiginosa, L.

Rosmarinus officinalis, Linné.

The Rosemary. Countries around the Mediterranean Sea, extending to Switzerland. This well-known bush is mentioned here as a medicinal plant. One of our best plants for large garden-edgings. The oil, distilled from its foliage, enters into certain compositions of perfumery; one cwt. of fresh herb yields about 2½ ounces of oil [Piesse]. The flowers are much sought by bees. Vilmorin states, that the seeds will keep for about four years; but the propagation from cuttings is easy also. Branches of this shrub will keep off moths from wearing-apparel packed away.

Rottboellia ophiuroides, Bentham.

Tropical East-Australia. A tall perennial grass, praised by Mr. Walter Hill for fodder. Hardy in regions free of frost.

Royenia Pseudebenus, E. Meyer.

South-Africa. Only a small tree, but its wood jet-black, and durable; in Capeland and Caffraria called ebony. R. pub

(Willdenow), according to Dr. Pappe, furnishes there a wood adapted for xylography; this may give a clue to the adaptability of many other kinds of woods in the large order of Ebenaceæ as substitutes for the Turkish boxwood.

Rubia cordifolia, Linné. (*R. Mungista,* Roxburgh.)

From the Indian highlands through China and Siberia to Japan; also occurring in various parts of Africa, as far south as Caffraria and Natal. This perennial plant produces a kind of madder. Probably other species likewise yield dye-roots. The genus is represented widely over the globe, but as far as known not in Australia.

Rubia peregrina, Linné.

Middle and Southern Europe, South-Western Asia. This perennial species also yields madder-root. Several other kinds deserve comparative test-culture.

Rubia tinctorum, Linné.

The Madder. Countries at the Mediterranean Sea, extending to temperate Western Asia. Hardy still at Christiania. A perennial herb of extremely easy culture. Soil, fit for barley, is also suitable for madder. Its culture opens any deep subsoil and suffocates weeds, but requires much manure, leaving the land enriched however. Stagnant water in the soil must be avoided, if madder is to succeed. The harvest is in the second or third year. It can be raised from seeds or planted from off-shoots. The roots merely dried and pounded form the dye. The chemical contents are numerous; in the herb: rubichloric and rubitannic acid; in the root: alizarin, purpurin, rubiacin, rubian, ruberythric acid and three distinct resins; also chlorogenin, xanthin and rubichloric acid. On the first five depend the pigments produced from the root. Madder is one of the requisites for alizarin-ink. Since the manufacture of artificial alizarin from anthracene, a constituent of coal-tar, was commenced, the cultivation of madder has declined. Still it remains a valuable root, handy for domestic dye. The root is also important as an emmenagogue.

Rubus acuminatus, Smith.

Indian mountains, at elevations between 4,000 and 7,000 feet. A scandent species with large fruits.

Rubus biflorus, Hamilton.

Indian mountains, at temperate altitudes between 7,000 and 10,000 feet. A rambling shrub, with sweet red or orange-colored fruit. Hardy in England. Another Himalayan species, R. macilentus (Cambessedes), has bright-yellow fruits.

Rubus caesius, Linné.*

The British Dewberry. Europe, Western and Northern Asia Resists extreme frosts, protracted dryness and also heat of exceptional seasons. In this respect the most accommodating of all blackberry-bushes. In Russia the berries are boiled together with apples into a preserve, which is of particularly pleasant taste. This Rubus supplies fruit till late in the season. Easily naturalised on ground subject to occasional inundations, and sheltered by bushy vegetation [Burmeister]. Some regard R. caesius as one of the numerous forms of R. fruticosus.

Rubus Canadensis, Linné.*

The Dewberry of Eastern North-America. A shrub of trailing habit. Fruit large, black, of excellent taste, ripening earlier than that of R. villosus (Aiton). It resists drought better than many others. The astringent root is a popular remedy in dysentery and diarrhœa. All the species can readily be raised from seeds; thus the naturalisation of these plants in adapted localities is easy by mere dissemination.

Rubus Chamaemorus, Linné.

The Cloudberry. North-Europe, North-Asia, North-America, particularly in the frigid zone. In Norway it grows northward to lat. 71° 10′ [Schuebeler]. A perennial but herbaceous plant; a pigmy amongst its congeners; nevertheless it is recommended for introduction to spongy, mossy, alpine moors, on account of its grateful amber-colored or red fruit. R. Arcticus (Linné) with fruit of exquisite taste, is usually its companion in the high north. A similar little herb, living for a great part of the year in snow—namely R. Gunnianus (Hooker)—occurs on the alpine heights of Tasmania, whence it might be easily transferred to snowy mountains of other countries. The fruit of R. Gunnianus is red and juicy, but not always well developed. To this category of dwarf plants with edible fruits belongs also R. Macgregorii (F. v. M.) from British New Guinea, restricted to cold elevations from 12,000 to 13,000 feet. R. calycinus (Wallich), occurring on the Indian mountains in regions between 4,000 and 9,000 feet, is also a dwarf herbaceous species, having a creeping stem and scarlet fruits, usually however with but few fruitlets.

Rubus cuneifolius, Pursh.

The Sand-Blackberry. Eastern North-America. A dwarf shrub. The fruit is of agreeable taste.

Rubus deliciosus, Torrey.*

About the sources of the Missouri. An erect, exceedingly some shrub. Fruit raspberry-like, large and grateful. As hr R. odoratus. The slender branches bending downward; dec also on account of its large flowers [Stein]. Foliage rem odorous [Masters].

Rubus ellipticus, Smith.* (*R. flavus,* Hamilton.)

On the mountains of India, from 4,000 to 7,000 feet elevation, also in Ceylon and Yunan. A large rather erect bush with yellow fruits, which are reckoned in flavor fully equal to the ordinary raspberry [C. B. Clarke].

Rubus fruticosus, Linné.*

The ordinary Blackberry-Bramble. All Europe, North- and South-Africa, Middle and Northern Asia. Hardy in Norway to lat. 60° 24′. The shrub bears well in a temperate clime. It likes above all calcareous soil, though it is content with almost any, and deserves to be naturalised on the rivulets of any ranges. In some countries it is a favorite plant for hedges. A Melbourne horticultural firm spends now already £100 a year for purchasing bramble-leaves as part material of bouquets, wreaths, garlands and grave-crosses. R. corylifolius (Smith), R. suberectus (Andrews) and R. leucostachys (Smith) are varieties like many other named kinds of European blackberries, or perhaps belong to the closely allied R. caesius; or in some instances hybrid-forms may have arisen from the two, although the generality of these various blackberry-bushes bear their fruit freely enough.

Rubus geoides, Smith.

Falkland-Islands, Fuegia, Patagonia and Chiloe. An herbaceous kind of raspberry-plant with greenish-yellow fruits, resembling the Cloudberry, and possessing a very agreeable taste. Best adapted for mountainous regions.

Rubus glaucus, Bentham.

Ecuador, at high elevations. There cultivated instead of the ordinary raspberry-bush [Dr. W. O. Focke].

Rubus Hawaiensis, A. Gray.

Sandwich-Islands. The fruit of this bramble-shrub is raspberry-like.

Rubus Idaeus, Linné.*

The ordinary Raspberry-bush. Europe and Northern Asia, eastward to Japan. In Norway hardy to lat. 70° 22′. It is mentioned here to point out the desirability of naturalising the plant on mountains and on river-banks. The fruits contain a stearopten. The leaves are sometimes used as a substitute for tea. With many congeners a superior honey-yielder.

Rubus imperialis, Chamisso.

Brazil and Argentina. Furnishes superior fruits.

Rubus lasiocarpus, Smith.

India, reaching in the Himalayas an elevation of about 10,000 feet, in Ceylon of 7,000 feet, in Java of 6,000 feet. The fruit is very palatable. R. opulifolius (Bertoloni) is closely allied. R. lanatus (Wallich) affords also edible but rather insipid fruits in Upper India [Aitkison].

Rubus Macraei, Asa Gray.

Hawaia, high up on the mountains. The "Akala." The fruit attains a diameter of nearly 2 inches, is dark-red, very juicy, and although slightly bitter quite pleasant to the taste [Dr. Hillebrand]. Would likely improve under cultivation.

Rubus Moluccanus, Linné.*

India, continental as well as insular, there ascending to 7,000 feet, advancing southward through New Guinea and East-Australia to Gippsland, northward to China and eastward to the Philippine-Islands and Fiji. A very tall and variable species. Fruit red. A variety, R. reticulatus (Wallich), ascends the Indian mountains to 10,000 feet [Sir J. Hooker], and is remarkable for its large fruit. The plant proved hardy at Christiania. It ripens in warm climes its fruits all the year round.

Rubus nutans, Wallich.

Himalayan mountains, ascending to about 10,000 feet; growing on the ground like strawberry-plants, yielding fruits of very pleasant subacid taste [Aitkison], but not of large size [J. Hooker]. A species easily spreading and probably improvable by culture.

Rubus occidentalis, Linné.*

The "Black Cap"-Raspberry or "Thimbleberry"-bush. North-America. A species with woody stems and nice fruits, the latter with a glaucous bloom, well flavored and large; it ripens early. To this bears near affinity R. leucodermis (Douglas) from California, Utah and Arizona; its fruit is yellowish-red, rather large and of agreeable flavor.

Rubus odoratus, Cornuti.

North-America. A kind of raspberry-bush. Handsome on account of its large purple flowers. Berries edible. Hardy in Norway to lat. 67° 56′. Culture would doubtless enhance the value of the fruits of many of these Rubi. Hybridising might be tried. R. Nutkanus (Mocino) is the Salmon-Raspberry of Western North-America and closely allied to R. odoratus.

Rubus parvifolius, Linné.

East-Asia, Eastern and Southern Australia. It produces r finer fruits in the Alps of Australia than in the lowlands

extends as a native to Japan, where according to Maximowicz 22 species of Rubus exist, many of them endemic, and probably some eligible for special fruit-culture.

Rubus phœnicolasius, Maximowicz.

Japan. A raspberry-bramble with fair-sized fruits.

Rubus rosifolius, Smith.

Tropical and sub-tropical regions of Africa and Asia, ascending the Himalayas to about 10,000 feet, also occurring throughout the litoral forests of East-Australia. In woody regions this shrub bears an abundance of fruits of large size, and these early and long in the season, though not so excellent as those of many other species. Also a native of New Guinea.

Rubus rugosus, Smith.*

In the mountainous parts of India, ascending the higher regions. A tall climber, evergreen at all events in mild climates. Introduced by the writer of this work into Australia. Richly bearing near Port Phillip [G. W. Robinson], where it produces fruit all the year round. Fruit comparatively large, from dark-red turning black. Jam from it exquisite. Allied to R. Moluccanus.

Rubus strigosus, Michaux.*

Eastern North-America, extending to Canada. Closely allied to the European raspberry. Its fruits large, of excellent taste.

Rubus tiliaceus, Smith.

Indian mountains, at altitudes between 3,000 and 8,000 feet; also in Polynesia. A rambling species. Fruit large, purplish-black, but rather insipid.

Rubus trivialis, Michaux.

South-Eastern States of North-America. Another shrubby species with particularly palatable fruits, which are large and black, and ripen very early in the season. The plant will thrive in dry sandy soil. Like many other congeners, this one has the bark rich in tannic acid.

Rubus ursinus, Chamisso and Schlechtendahl. (*R. macropetalus,* Douglas.)

California and Oregon. An unisexual shrub. Fruit black, oval-cylindric, particularly sweet. Readily rendered spontaneous. It would lead too far to enumerate other utilitarian kinds of Rubus, although altogether about one hundred genuine species do occur, which render the genus one of very wide dispersion over the globe.

Rubus villosus, Aiton.

Eastern North-America, reaching Canada, there the ordinary Blackberry-bush. Growth tall. Fruit large and pleasant [Asa Gray]. The Rochelle- and Lawton-varieties are of this species [C. Koch]. The root-bark is praised for medicinal purposes.

Rumex Acetosa, Linné.

The Kitchen-Sorrel. Europe, Middle and Northern Asia to Japan, also in the frigid zone of North-America. Endures the frost of Norway northward to lat. 71° 10′ [Schuebeler]. A perennial herb. The tender varieties, particularly the Spanish one (R. Hispanicus, Koch), also the alpine one (R. montanus, Desfontaines) serve as pleasant acidulous vegetables, but must be used in moderation, as their acidity, like that of the species of Oxalis (Wood-Sorrel), depends on binoxalate of potash. The South-African R. luxurians, L., serves likewise as culinary sorrel. Aquatic species of Rumex help to solidify embankments subject to floods.

Rumex hymenosepalus, Torrey.

Arizona, Texas, New Mexico, Southern California. This "Dock," vernacularly known as "Canaigré," has come into use in tanneries, the roots acting by their powerful tan-principle doubly as quick as oak-bark. This may prove a hint for testing other large species of the extensive genus Rumex in this respect. The root of R. hymenosepalus yields in a dry state 23½ per cent. rheo-tannic acid. W. N. Evans found even 37½ per cent. tanning principle in the dried root according to Dyer. The foliage serves as a culinary vegetable.

Rumex Patientia, Linné.

Middle and Southern Europe, South-Western Asia. Biennial. It is the R. sativus of Plinius according to Fraas. Bears the cold of Norwegian winters to lat. 70°. The young leaves furnish a palatable sorrel-like spinach. In cold climes it pushes forth its leaves, before the frost is hardly gone, and thus comes in as one of the first vegetables of the season.

Rumex scutatus, Linné.

The French Sorrel. Middle and Southern Europe, Northern Africa, Orient. Also perennial, and superior to the foregoing as a culinary plant. They are all of use against scurvy, and most eas reared. Dr. Rosenthal lauds even the common R. crispus (Lin of Europe and Asia as a spinach-plant; further for culinary p poses, R. pulcher (Linné) and R. bucephalophorus (Linné) f the countries at or near the Mediterranean Sea.

Rumex vesicarius, Linné.

Southern Europe, Middle Asia, Northern Africa. An annual herb of the same utility as other sorrels.

Ruscus aculeatus, Linné.

Middle and Southern Europe, Northern Africa, South-Western Asia This odd plant serves for forming garden-hedges. The young shoots of this and a few allied plants are edible.

Russula vesca, Fries.

Europe. One of the best of mushrooms for the kitchen within the genus Russula, which has representatives in most parts of the globe. Dr. Cooke mentions further as culinary R. lepida and R. virescens (Fries). Professor Morren notes R. integra (Fries) as used among the Belgian champignons. Under any circumstances, mushrooms should only be used when freshly collected or quickly dried.

Ruta graveolens, Linné.

The Rue. Mediterranean countries and the Orient. Hardy in Norway to lat. 63° 26′. The foliage of this acrid and odorous shrub, simply dried, constitutes the rue-herb of medicine. The allied R. sylvestris (Miller) is still more powerful in its effect. These plants and others of the genus contain a peculiar volatile oil and a glycosid, the rutin. Fresh they should be handled most cautiously, best with gloves.

Sabal Adansoni, Guernsent.

Dwarf Palmetto. South-Carolina, Georgia and Florida. A stemless Fan-palm, with the following congeners, Rhaphidophyllum Hystrix and Washingtonia filifera, attaining the most northerly positions of any American palms. According to Count de Saporta it resists a temperature as low as 17° F. Professor Ch. Naudin found it to endure the frosts in Southern France to 43° 20′ north latitude. This palm does well in marshy places.

Sabal Palmetto, Loddiges.

Extends from Florida to North-Carolina, 36° N.L. The stem attains a height of 40 feet. This hardy palm delights on sandy coast-tracts. Stems almost imperishable under water, not attacked by the teredo.

Sabal umbraculifera, Grisebach.

West-Indies. Attains a height of 80 feet or occasionally even over 100 feet. Though naturally a tropical Savannah-palm. it has proved even hardier than the orange. A near relative is S. Blackburniana (Glazebrook), a native of Bermuda, where, according to Sir John Lefroy, it gains a stem height of 50 feet, and where the

leaves are extensively used for plat; the sweet pulp of the fruit is edible. At Hyères this palm withstood a temperature of 22° F. [Bonnet]. Another equally tall Antillan palm is S. glaucescens (Loddiges). All bear seeds freely.

Sabbatia angularis, Pursh.

North-Eastern America. This pretty biennial herb is lauded as a substitute for gentian by American physicians, and might with its congeners be grown in medicinal gardens, though its naturalization would not be desirable, as pastoral animals avoid the bitter gentianaceous plants.

Saccharum officinarum, Linné.*

The Sugar-Cane. Most Southern Asia and South-Sea Islands, seemingly spontaneous; probably derived from one of the native species there; according to Loureiro indigenous in Cochin-China, an observation confirmed by Dr. Bretschneider. Sugar-cane having been cultivated in Spain and other countries on the Mediterranean Sea, it will be worthy of further trial, at what distance from the equator and at what elevations in tropical parts of the globe sugar from cane can be produced to advantage. In the United States the profitable culture of cane ceases at 32° north latitude; in Japan it is carried on with advantage to 36° north latitude and even further northward [General Capron]; the average-yield of raw sugar even there is 3,300 lbs. per acre; in China this crop extends only to 30° north latitude; in East-Australia to the northern part of New South Wales, lat. 29½°. Moderate proximity to the sea is favorable for the growth of canes. The multiplication of all sorts of sugar-cane is usually effected from top cuttings; but this cannot be carried on from the same original stock for an indefinite period without deterioration; and as seeds fit to germinate do not ripen on cultivated canes, new plants must from time to time be brought from a distance. Thus, New Caledonia and Fiji have latterly supplied their almost wild-growing splendid varieties for replanting many sugar-fields in Mauritius and some other places. Lately however Harrison and Bell have raised plants from seeds in Barbadoes, Dyer and Morris at Kew, and earlier still Benecke in Java. Thus new varieties may be realised. The Bourbon-variety is praised as one of the richest for sugar; the Batavian variety, S. violaceum (Tussac), is content with less fertile soil. From China we have a particular kind (S. Sinense, Roxburgh), which is hardier and bears the drought better than the ordinary cane; this kind needs renewal only every third year, and ripens in seven months, if planted early in spring; but if planted in autumn and left standing for fully a year the retu of sugar is larger. A species of Saccharum, distinct from wild and cultivated form of S. officinarum, is indigenous on north-coast of New Guinea; the stem is thin and hard, but (M. de M. Maclay). The Hawaian variety of cultivated ca

its rigidity and remaining straight till ripening, is particularly eligible for regions subject to severe storms. Mr. R. McDougall recommends the "Fiji grey" variety. particularly for Queensland, the canes growlng quickly and being remarkably weighty. Many other varieties are known. The sugar-cane is one of the best of all plants of economic value, to keep cleared ground in tropical forests free from weeds or the invasion of other plants. Excessive rains produce a rank luxuriance of the canes at the expense of the saccharine principle. Rich manuring is necessary to obtain good crops, unless in the best of virgin soil. The lower leaves of the stem must successively be removed, also superabundant suckers, to promote the growth upwards, and to provide ventilation and light. Out of the remnants of sugar-cane either molasses or rum or taffia can be prepared, The average-yield of sugar varies from 1 ton 6 cwt. to 3 tons for the acre; but exceptionally as much as 6 tons per acre have even been obtained in the hardly tropical Hawaian Islands. The world's production of cane-sugar in 1875 amounted 2,140,000 tons [Boucheraux], in 1886 to 2,583,000 tons [F. O. Licht]. Among some other works for fuller information the valuable volume of Mr. A. Mackay, "The Sugar-Cane in Australia," should be consulted, particularly in the far southern colonies. For the conditions and prospects of the cane-sugar industry in the Southern United States see the special report of the Hon. General Le Duc, Washington, 1877; also the "Sugar Industries of the United States,"by H. W. Wiley, 1885. The stately S. spontaneum (Linné), which extends from India to Egypt and New Guinea, is available for scenic culture. It attains a height of 15 feet, and ascends in Java, according to Dr. Junghuhn's observations, to a height of 17,000 feet. Other tall kinds of Saccharum occur in South-Asia.

Sagittaria lancifolia, Linné.

From Virginia to the Antilles. This very handsome aquatic plant can doubtless be utilised like the following species. It attains a height of five feet.

Sagittaria obtusa, Muehlenberg. (*S. latifolia,* Willdenow.)

North-America, where it replaces the closely allied S. sagittifolia. A few other conspicuous species are worthy of introduction. The Tule- or Wapatoo-root of California is derived from S. variabilis (Engelmann).

Sagittaria sagittifolia, Linné.

Europe, Northern and Middle Asia, east to Japan. One of the most showy of all hardy water-plants; still not alone on that account deserving naturalisation, but also because its root is edible. If once established, this plant maintains its ground well, and might occupy submerged spots not otherwise utilised For a full account of this plant refer to Bulletin de la Soc. d'Acclimat. 1888, p. 1102-1106.

Salix alba, Linné.*

The Huntingdon or Silky Willow of Europe, originally of North-Africa, Northern and Western Asia; according to Prof. Andersson of exclusively Asiatic origin, yet praised already in the Odyssee. It bears the frosts of Norway to lat. 63° 52′. It is positively known, that the Silky Willow will live to an age of 150 years, and probably much longer. Available for wet places not otherwise in cultivation. Height reaching to 80 feet, circumference of stem sometimes to 20 feet; of rapid growth. Foliage silvery-pubescent. Wood smooth, soft and tough, bearing pounding and knocking better than that of any other British tree; eligible where lightness, pliancy and elasticity are required; hence in request for wheel-floats and shrouding of water-wheels, as it is not subject to splinter; for the sides and bottoms of carts and barrows, for break-blocks of trucks; also used for turnery, trays, fenders, shoe-lasts, light handles [Simmonds]. Its weight is from 26 to 33 lbs. per cubic foot. Timber, according to Robb, the lightest and softest of all prominently utilitarian woods; available for bungs; it is planed into chips for hat-boxes, baskets and woven bonnets; also worked up for cricket-bats, boxes, and many utensils, as well as for matches. The charcoal is excellent for gunpowder. The bark is particularly valued as a tan for certain kinds of glove-leather, to which it imparts an agreeable odor. Mr. Scaling records, that in rich grounds on the banks of streams this willow will grow to a height of 24 feet in 5 years with 2 feet basal girth of the stem; in 8 years he found it to grow 35 feet, with 33 inches girth at 1 foot from the ground. Loudon noticed the height to be 53 feet in 20 years, and the girth 7½ feet. In winterless countries the growth is still more rapid. To produce straight stems for timber, the cuttings must be planted very close, some of the trees to be removed from time to time. After 30 or 40 years the trees will deteriorate. Scaling estimates the value of an acre of willow-timber to be about £300. The Golden Osier, Salix vitellina, L., is a variety. The shoots are used for hoops and wicker-work. With other large willows and poplars one of the best scavengers for back-yards, where drainage cannot readily be applied; highly valuable also for forming lines along narrow watercourses or valleys in forests, to stay bush-fires. All willows, as early flowering, are of particular importance to apiarists [Cook, Quinby]. The extreme rapidity of growth of most willow-trees and poplars, particularly in mild climes, renders it quite feasible, to rear them purposely for providing wood as an adjunct to paper-material, particularly on ground not eligible as agrarian.

Salix Babylonica, Tournefort.* (*S. pendula,* Moench.)

The Weeping Willow. Indigenous in North-China; sparin wild, according to Stewart, in the Himalayas probably likewis Persia and Kurdistan. One of the most grateful of all trees the facility of its culture and its fitness for embellishment; one of the quickest growing and most easily reared of all

trees. Fifty feet upward growth has been witnessed in five years. Pasture-animals browse on the young foliage. The tree is important for consolidating river-banks, and everywhere available for cemeteries. In frostless climes annually only for a few weeks without leaves. In Norway it will grow northward to lat. 58° 8′. A powerful scavenger of back-yards, but apt to undermine masonry and to get into cisterns. Dr. C. Koch prefers Moench's name S. pendula, as the Weeping Willow is not a native of Babylon, and he distinguishes another Weeping Willow from Japan as S. elegantissima, which is still hardier than S. Babylonica.

Salix Capensis, Thunberg. (*S. Gariepina,* Burchell.)

South-Africa. This willow might be introduced on account of its resemblance to the ordinary Weeping Willow. Prof. Harvey says of it, that it is one of the greatest ornaments of the banks of the Gariep-River.

Salix caprea, Linné.

Europe, Northern and Middle Asia. The British Sallow or Hedge-Willow. In Norway it extends to lat. 70° 37′; in 65° 28′ Prof. Schuebeler found it to attain a height of nearly 70 feet. The Kilmarnock Weeping Willow is a form of this species. Wood used for handles and other implements, the shoots for hoops; it is also largely employed for gunpowder-coal. Bark available for tanning, particularly glove-leather. The flowers are eagerly sought by bees. It is one of the earliest flowering of willows, hence with S. daphnoides, as the harbinger of spring, particularly gladdening to bees, although all willows are honey-plants.

Salix cordata, Muehlenberg.

One of the Osiers of North-America, extending to Canada. Fit also to bind sand. One of the dwarf Californian willows has been found on the coast-sands to send out root-like stems to 120 feet in length.

Salix daphnoides, Villars.

Northern and Middle Europe and Northern Asia, eastward as far as the Amoor, ascending to 15,000 feet in the Himalayas, growing in Norway northward to lat. 62° 20′. A tree, rising to about 60 feet in height, rapid of growth, attaining 12 feet in four years. It is much chosen to fix the ground at railway-embankments, on sandy ridges and slopes, for which purposes its long-spreading and strong roots render it particularly fit. The twigs can be used for baskets, wicker-work and twig-bridges [Stewart and Brandis]. The variety *pruinosa* is considered by Dr. Sonder to be as valuable as the Bedford-Willow. The foliage furnishes cattle-fodder. The tree is comparatively rich in salicin, like S. pentandra (Linné) and S. fragilis.

Salix Daviesii, Boissiers.

Persia. This tree is there and in Afghanistan cultivated. Pollarded for cattle-feed in early spring. Wood used for lintels, spinning-wheels, handles, dishes, platters, fruit-boxes and charcoal [Brigade-Surgeon Aitchison]. S. Songorica (Andersson) is used there for similar purposes.

Salix fragilis, Linné.

The Crack-Willow or Withy. Indigenous in South-Western Asia; widely spontaneous also in Europe. Hardy in Norway to lat. 64° 5′. Height to 90 feet; stem reaching 20 feet in girth. According to Scaling next to S. alba the best of the European timber-willows, but the wood not quite so tough and the tree requiring more space for growth. Both species are recommended for shelter-plantations, on account of their rapidity of growth, uninflammability and easy propagation; the latter quality they share with most willows. A variety or hybrid of this species is the Bedford-Willow, also called Leicester-Willow, Salix Russelliana (Smith), which yields a light, elastic, tough timber, more tannin in its bark than oak, and more salicin (a substitute for quinine and most valuable as an anti-rheumatic remedy) than most of its congeners. According to Sir H. Davy the inner layers of the bark contain fully 16 per cent. tannin, the whole bark only about 7 per cent.

Salix Humboldtiana, Willdenow.

Through a great part of South-America, southward as far as Patagonia, there furnishing building timber for inside-structures. This willow is of pyramidal habit, attains a height of 50 feet and more, and is in moist ground of quick and ready growth. The wood is locally much in use for yokes and other implements. Many kinds of willows can be grown for consolidating shifting sand-ridges.

Salix Japonica, Thunberg.

Japan. Here mentioned, to draw attention to its distinctness from S. Babylonica, to which Prof. Andersson referred it as a variety.

Salix longifolia, Muehlenberg.

North-America, from the Atlantic to the Pacific Ocean. Acquires finally a height of about 20 feet; likes to creep on sand and gravel along river-banks. It is one of the species forming long flexible wythes. S. petiolaris (Smith) and S. tristis (Aiton) are among the North-American species best fitted for binding sand.

Salix lucida, Muehlenberg.

One of the Osiers of North-America, reaching Canada. L
banks for its habitation.

Salix nigra, Marshall. (*S. Purshiana,* Sprengel.)

The Black Willow of North-America. It attains a height of 30 feet. One of the willows used for basket-work, although it is surpassed in excellence by some other species, and is more important as a timber-willow. Mr. W. Scaling of Basford includes it among the sorts, which he recommends in his valuable publication, "The Willow," London, 1871. Mr. M. A. Bebb of Illinois has latterly devoted great attention to the study of the American willows.

Salix purpurea, Linné.*

Of wide range in Europe, Northern and Western Asia, extending also to North-Africa, according to Sir J. Hooker. The Bitter Willow; one of the Osiers. Hardy in Norway northward to lat. 67° 56′. In deep moist soil, not readily otherwise utilised, it will yield annually per acre four to five tons of the best of rods, qualified for the finest work. Impenetrable, not readily inflammable screens as much as 25 feet high can be reared from it in five years. In localities, exposed to storms, willow-copses fully 40 feet high can be raised from this species. It forms a variety with pendant branches. It is most valuable also for the reclamation of land along watercourses. Rich in salicin, which collaterally can be obtained from the peelings of the twigs, when the latter are prepared for basket-material. From Mr. Scaling's treatise on the Willow, resting on unrivalled experience, it will be observed, that he anew urges the adoption of the Bitter Willow (also called the Rose-Willow or the Whipcord-Willow) for game-proof hedges, this species scarcely ever being touched by cattle, rabbits and other herbivorous animals. Not only for this reason, but also for its very rapid growth and remunerative yield of the very best of basket-material, he recommends it for field-hedges. Cuttings are planted only half a foot apart, and must be entirely pushed into the ground. The annual produce from such a hedge is worth 4s. to 5s. for the chain. To obtain additional strength the shoots can be interwoven. In rich bottoms the shoots will grow from 7 to 13 feet in a year. The supply of basket-material from this willow has fallen very far short of the demand in England. The plant grows vigorously on light soil or warp-land, but not on clay. It likes sandy loam, and will even do fairly well on gravelly soil, but it is not so easily reared as S. triandra. Mr. Scaling's renewed advocacy for the formation of willow-plantations comes with so much force, that his advice is here given, though condensed in a few words. Osier-plantations come into full bearing in the third year; they bear for about ten years and then slowly decline. The raw produce from an acre in a year averages 6 to $7\frac{1}{2}$ tons, ranging from £2 10s. to £3 10s. for the ton (unpeeled). Although 7,000 acres are devoted in Britain to the culture of basket-willows (exclusive of spinneys and plantations for the farmer's own use), yet in 1866 there had to be imported from the Continent 4,400 tons of willow-branches, at an expense of £44,000, while besides the value of the

made baskets imported that year was equal to that sum. In recent years the importation into the United States of willow-material for baskets, chairs and other utensils has, according to Simmonds, been estimated as approaching 1,000,000 dollars. Land, comparatively unfit for root- or grain-crops, can be used very remuneratively for osier-plantations. The soft-wooded willows like to grow in damper ground than the hard-wooded species. The best peeled willow-branches fetch as much as £25 for the ton. Peeling is most easily effected by steam, by which means the material is also increased in durability. No basket-willow will thrive in stagnant water. Osier-plantations in humid places should therefore be drained. The cuttings are best taken from branches one or two years old, and are to be planted as close as one foot by one foot and a half. No part of the cutting must remain uncovered, in order that only straight shoots may be obtained; manuring and ploughing between the rows is thus also facilitated, after the crop has been gathered, and this, according to the approved Belgian method, must be done by cutting the shoots close to the ground after the fall of the leaves. The accidental introduction from abroad of destructive saw-flies (particularly Nematus ventralis), which prey also on currant- and gooseberry-bushes, should be guarded against.

Salix rubra, Hudson.*

Throughout Europe, also in West-Asia and North-Africa; much chosen for osier-beds. When cut down, it will make shoots 8 feet long in a season. Dr. Porcher regards it as one of the most valuable species for work, in which unpeeled rods are used. It is also admirably adapted for hedges. The bark is one of the best for salicin. Considered by some as a hybrid between S. purpurea and S. viminalis.

Salix tetrasperma, Roxburgh.

Mountains of India, from 2,000 to 7,000 feet. Height of tree reaching 40 feet. This thick-stemmed willow is worthy of a place on banks of watercourses. The twigs can be worked into baskets, the wood serves for gunpowder, the foliage for cattle-fodder.

Salix triandra, Linné.* (*S. amygdalina,* Linné.)

The Almond-Willow. Through nearly all Europe and extra-tropical Asia. Height of tree at length 30 feet. It sheds its bark annually after the third year. Likes rich loamy soil; requires less space than S. viminalis, more than S. purpurea. It is a prominent representative of the hard-wooded basket-willows, and comprises some of the finest varieties in use by the manufacturers. Shoots are obtainable 9 feet long; they answer for hoops and white basket-work being pliant and durable. The bark contains a good deal of salici For basket-purposes 20,000 to 30,000 cuttings can be planted on acre, and 2,000 to 3,000 can be planted in a day by an expert; second year's crop is already of considerable value; at five ye

comes to its prime, the plantation holding good for 15 to 25 years. The rods for baskets should be cut as soon as the leaves have dropped. The annual value of a crop of basket-willows is in England from £25 to £35 per acre [Scaling]. The cultivation of basket-willows along railroads has proved in cold countries one of the best protectives against snow-drifts. S. lanceolata (Smith) is a hybrid between S. triandra and S. viminalis, according to Prof. Andersson.

Salix viminalis, Linné.*

The common Osier of Europe, North- and West-Asia. Height to 30 feet. The best of basket-willows for banks subject to occasional inundations. It is a vigorous grower, very hardy (to lat. 67° 56′ in Norway), likes to be fed by deposits of floods or by irrigation, and disposes readily of sewage [Scaling]. One of the best for wicker-work and hoops; when cut it shoots up to a length of 12 feet; distinguished by the basket-makers as the soft-wooded willow; it is best for rods requiring two years' age, but inferior to several other species for basket-manufacture. Prof. Wiesner mentions this species among those drawn into use for tanning purposes. S. Smithiana (Willdenow) is a hybrid of S. viminalis and S. caprea, and has proved one of the best willows for copses and hedges. Its growth is very quick and its foliage remarkably umbrageous. In the Hamburg willow-plantation of Mr. F. Olandt five millions of willow-cuttings were at disposal in the autumn of 1885. It would lead too far to enumerate even all the more important willows on this occasion. Professor Andersson, of Stockholm, admits 158 species. Besides these, numerous hybrids exist. Many of the taller of these willows could be grown to rural or technologic advantage.

Salpichroma rhomboides, Miers.

Extra-tropical South-America, as far south as Magelhaen's Straits. A half-shrub, with good-sized berries of vinous taste [Lorentz].

Salvia Matico, Grisebach.

Sub-alpine Argentina. An important medicinal herb.

Salvia officinalis, Linné.

The Garden-Sage. South-Europe, ranging to Switzerland. Endures the climate of Norway to lat. 70°. A somewhat shrubby plant of medicinal value, pervaded by essential oil. Prefers calcareous soil. Counted also with honey-plants; enters into some condiments. S. Sclarea (Linné), which ranges from South-Europe to Persia, is similarly drawn into use, and was grown by Imperial order already in the gardens of Charles the Great [E. Meyer]. S. ceratophylla (Linné), of South-Western Asia, has strongly lemon-scented foliage. Among nearly half a thousand species of this genus some are gorgeously ornamental.

Sambucus australis, Chamisso and Schlechtendal.

Southern Brazil and La Plata-States. Resembles the ordinary elder, and is locally used for tall hedges [Dr. Lorentz].

Sambucus Canadensis, Linné.

North-Eastern America. The berries of this half-woody elder are used like those of Phytolacca decandra, for coloring vinous liquids. Dr. Gibbons observes, that this species is recognised in the United States Pharmacopœia, and that S. Mexicana (Presl.) and S. racemosa (Linné) possess similar medicinal properties. The flowers are gently excitant and sudorific, the berries diaphoretic and aperient; a kind of wine is frequently manufactured from them; the inner bark in large doses acts as a hydragogue cathartic and as an emetic. S. xanthocarpa (F. v. Mueller) is a large elder-tree of extra-tropical East-Australia. S. Gaudichaudiana (De Candolle) of the same region is a herbaceous species, the root of which has emetic property.

Sambucus nigra, Linné.

The ordinary Elder. Europe, Northern Africa, Western Asia. Endures the frosts of Norway northward to lat. 66° 5′ [Schuebeler]. Known to have exceptionally attained a height of 35 feet. The flowers are of medicinal value, and an essential oil can be obtained from them. The wood can be utilized for shoe-pegs and other purposes of artizans; that of old trees is very hard and can even be used as a substitute for boxwood. The berries are used for making a palatable wine, also for coloring portwine and for other dyeing purposes. The roots of the elder possess highly valuable therapeutic properties, according to Dr. Al. Buettner, especially antihydropic.

Sanguinaria Canadensis, Linné.

North-Eastern America. "Blood-root." A perennial herb. Hardy to lat. 63° 26′ in Norway. The root important as a therapeutic agent. It contains also dye-principles. An excellent bee-plant [Cook].

Sanguisorba minor, Scopoli. (*Poterium Sanguisorba*, Linné.)

The Salad-Burnet. Europe, North-Africa, Northern and Western Asia. A perennial herb, easily disseminated and naturalised, particularly adapted for calcareous soils. Bears the hot dry summer seasons in the interior of Australia well [Armytage]. S. polygama (F. v. Mueller: Poterium polygamum, Waldstein a Kitaibel) is an allied and equally useful species. Both serve salad and particularly as a sheep-fodder.

Sanseviera Zeilanica, Willdenow.

India. This thick-leaved liliaceous plant should not be passed in this enumeration, as it has proved hardy in temperate climes, free from frost. Four pounds of leaves give nearly one pound of fibre, which unites softness and silky lustre with extraordinary strength and tenacity, serving in its native country particularly for bow-strings. The plant might be left to itself for continued growth in rocky unutilized places. Several species, South-Asiatic as well as African, exist.

Santalum album, C. Bauhin.

India, ascending to the temperate elevations of Mysore. A small or middle-sized tree, famed for its fragrant wood and roots. In the drier and stony parts of ranges the greatest fragrance of the wood is generated. S. Freycinetianum (Gaudichaud) produces santal-wood of particularly rich perfume on the mountains of Hawaia up to 3,000 feet. Several other species occur in Polynesia. The precious santal-oil is obtained by slow distillation from the heartwood and root, the yield being about two and a half per cent. It is worth about £3 per pound, and important not only for cosmetic but also for medicinal purposes. Santalum Austro-Caledonicum (Vieillard), from New Caledonia, furnishes there santal-wood, excellent for strength and agreeableness of odor [Simmonds].

Santalum cygnorum, Miquel.

South-Western Australia, where this small tree furnishes scented santal-wood. The wood on distillation yields nearly 2 per cent. oil [Seppelt and Noyes]. It answers also well for select cabinet-work. Export during 1885, 4,527 tons, at a value of £36,216. Among Australian trees Olea paniculata (R. Brown) has also a nicely scented wood.

Santalum Preissianum, Miquel. (*S. acuminatum,* A. de Candolle.)

The Quandong. Desert-country of extra-tropical Australia. The fruits of this small tree are called Native Peaches. As both the succulent outer part and kernel are edible, it is advisable to raise the plant in desert-tracts. Dromedaries, according to Mr. E. Giles, feed on the foliage.

Santalum Yasi, Seemann.

The Santal-tree of the Fiji-Islands, where it grows on dry and rocky hills. It is likely to prove hardy, and deserves, on account of its powerful scent, with a few other species from the South-Sea Islands, yielding scented wood, test-culture in warm temperate regions.

Santolina Chamæ-Cyparissus, Linné.

Countries on the Mediterranean Sea. A very aromatic and handsome bush, of medicinal value. There are several allied species.

Saponaria officinalis, Linné.

The Soapwort or Fuller's Herb. Europe, Northern and Western Asia. Hardy in Norway to lat 63° 26′ [Schuebeler]. A perennial herb of some technologic interest, as the root can be employed with advantage in some final processes of washing silk and wool, to which it imparts a peculiar gloss and dazzling whiteness, without injuring in the least any subsequent application of the most sensitive colors. The same purpose serves Saponaria Struthium (Loeffling) of Spain. Both have also medicinal value.

Sassafras officinale, Hayne.

The deciduous Sassafras-tree, indigenous from Canada to Florida, occurring in dry open woods. Height sometimes to 80 feet; the stem has been known to attain a girth of more than 19 feet at 3 feet from the ground. It furnishes the medicinal sassafras-bark and wood, and from this again an essential oil is obtainable. The deciduous and often jagged leaves are remarkable among those of Lauraceœ; they are used as a condiment in cookery. The root-bark contains 58 per cent. tannin [Reinsch]. The wood ranks also as a material for a lasting dye; for turnery it is easily worked, and proved of great resistance to the influence of water [Dr. C. Mohr.]

Satureja hortensis, C. Bauhin.

The Summer-Savory. Countries around the Mediterranean Sea. An annual scent-herb, from which an essential aromatic oil can be distilled; it is used also as a condiment. The culture of this and allied plants is easy in the extreme. This is one of about 100 kinds of plants, which Charles the Great already ordered to be grown in his domains or gardens [E. Meyer]. The successful cultivation extends in Norway to 70° 22′ [Schuebeler].

Satureja montana, Linné.

The Winter-Savory. On arid hilly places at and near the Mediterranean Sea. A perennial somewhat shrubby herb, frequently used as a culinary condiment along with or in place of the foregoing species, although it is scarcely equal to it in fragrance.

Satureja Thymbra, Linné.

Countries on or near the Mediterranean Sea. A small evergreen bush, with the flavor almost of thyme. The likewise odorous S. Graeca and S. Juliana (Linné) have been transferred by Benth. to the closely cognate genus Micromeria; they have been in

since Dioscorides' time, though not representing, as long supposed, the Hyssop of that ancient physician, which according to Sprengel and Fraas was Origanum Smyrnaeum or some allied species.

Saussurea Lappa, Bentham. (*Haplotaxis Lappa,* Decaisne; *Aucklandia Costus,* Falconer).

Cashmere, at elevations from 8,000-12,000 feet. The aromatic root of this tall perennial species is of medicinal value, and by Dr. H. Falconer considered to be the Costus of the ancients. It is said, that the annual export has been as much as one thousand tons, a large portion used for incense, further as an insecticide, keeping moths from cloth; the leaves for the same reason being used as emballage for shawls [De Rinzi]. Could easily be transferred to our and other Alps, if not deteriorating the pastures.

Saxono-Gothæa conspicua, Lindley.

The Mahin of Southern Chili and Patagonia. A middle-sized tree, with fine-grained yellowish timber.

Scandix grandiflora, Linné.

Countries around the Mediterranean Sea. An annual herb, much liked there as a salad of pleasant aromatic taste.

Schima Wallichii, Choisy.

India, up to 5,000 feet. A tree attaining a height of about 100 feet. Timber highly valuable [C. B. Clarke].

Schinus Molle, Linné.

From Mexico to Chili, ascending the Andes to about 12,000-13,000 feet. A tree, thriving on dry and sandy soil, odorous in all its parts; the foliage in bouquets a good substitute for ferns and not quickly shrivelling; the jerking motion of leaf-fragments thrown into water very remarkable; the somewhat spicy small fruits serving as condiment. Will bear droughts and the intense summer-heat of Central Australia better than almost any other introduced plant [Mackay; Kempe]. S. terebinthifolia (Raddi) from Brazil proved a good promenade-tree in Victoria.

Schizostachyum Blumei, Nees.

Java, at an elevation of about 3,000 feet. A lofty Bamboo. A few other species, less elevated, occur in China, in the South-Sea and Philippine-Islands, also in Madagascar. The Bamboos being thus brought once more before us, it may be deemed advisable, to place together in one brief list all kinds, which are recorded either as very tall or as particularly hardy. Accordingly, from Major-General Munro's admirable monography (Transactions of the Linnean Society, 1868) the succeeding enumeration is compiled, and from that masterly essay, resting on very many years' close

study of the richest collections, a few preparatory remarks are likewise offered, to vindicate the wish of the writer of seeing these noble and graceful forms of vegetation largely transferred to every part of Australia, and indeed to many other portions of the globe, where they would impress a grand tropical feature on the landscapes. Even in the far southern latitudes of Victoria, Tasmania and New Zealand, some Bamboos from the Indian lowlands have proved able, to resist our occasional night-frosts of the low country; but in colder places the many sub-alpine species could be reared. Be it remembered, that Chusquea aristata advances to an elevation of 15,000 feet on the Andes of Quito, indeed to near the zone of perpetual ice. Arundinaria racemosa and A. spathiflora live on the Indian highlands, at a zone between 10,000 and 11,000 feet, where they are annually beaten down by snow. Forms of Bambusaceæ still occur, according to Grisebach, in the Kurilian achipelagus up to 46° N., and in Japan even to 51°. We may further recognise the great importance of these plants, when we reflect on their manifest industrial uses, when we consider their grandeur for picturesque scenery, when we observe their resistance to storms or heat, or when we watch the marvellous rapidity with which many develop. Their seeds, though generally produced only at long intervals, are valued in many instances higher than rice. The ordinary great Bamboo of India is known to grow 40 feet in forty days, when bathed in the moist heat of the jungles. Delchevalerie noticed the growth of some Indian Bamboos at Cairo to have been 10 inches in one night. Their power of growth is such, as to upset stone-walls or demolish substantial buildings. As shelter-plants for grazing animals these giant-reeds are most eligible. The Bourbon-Bamboo forms an impenetrable sub-alpine belt of extraordinary magnificence in that island. Dendrocalamus Brandisii, the Tenasserim-Bamboo, rises to about 150 feet, the mast-like cane sometimes measuring fully one foot in diameter. The great West-Indian Arthrostylidium is sometimes nearly as high and quite as columnar in its form, while the Dendrocalamus at Pulo-Geum is equally colossal. The Platonia-Bamboo of the highest wooded mountains of Panama sends forth leaves occasionally 15 feet in length and 1 foot in width. Arundinaria macrosperma, as far north as Philadelphia, still rises to a height of nearly 40 feet in favorable spots, and one of the Japan-Bamboos, according to Mr. Christy, gains the height of 60 feet even in those extra-tropical latitudes. Through perforating with artistic care the huge canes of various Bamboos, musical sounds can be melodiously produced, when the air wafts through the groves, and this singular fact may possibly be turned to practice for checking the devastations from birds on many a cultured spot. Altogether twenty genera, with one hundred and seventy well-marked species, are circumscribed by General Munro's consummate care; but how may these treasures yet be enriched, when once the alpine mountains of New Guin through Bamboo jungles have been scaled, or when the highla on the sources of the Nile, which Ptolemæus and Julius C

already longed to ascend, have become the territory also of phytologic researches, not to speak of many other tropical regions as yet left unexplored! Europe possesses no Bamboo; Australia, as far as hitherto ascertained, only five. Almost all Bamboos are local, and there seems really no exception to the fact that none are indigenous to both hemispheres, a remark which applies to Palms as well, with the sole exception of Cocos nucifera, the nuts of which indeed may have drifted from the western to the eastern world. All true Bambusas are Oriental. Observations on the growth of many Bamboos in Italy are recently offered by Chevalier Fenzi. The introduction of these exquisite plants is one of the easiest imaginable, either from seeds or the living roots. The consuls at distant ports, the missionaries, the mercantile and navigating gentlemen abroad, and particularly also many travellers could all easily aid in transferring the various Bamboos from one country to another—from hemisphere to hemisphere. Most plants of this kind, once well established in strength under glass, can be trusted out in climes of mild temperature to permanent locations with perfect and lasting safety at the commencement of the warm season. Indeed, Bamboos are hardier than most intra-tropical plants, and the majority of them are not the denizens of the hottest lowlands, but delight in the cooler air of mountain-regions. Strong manuring brings some tardy flowering Bamboos early into bloom. In selecting the following array from General Munro's monograph, it must be noted, that it comprises only a limited number, and that among those, which are already to some extent known, several as yet cannot be defined with precision in their generic and specific relation; evidently some occur, which in elegance, grace and utility surpass even many of those now specially mentioned:—

Arthrostylidium excelsum, Grisebach. West Indies. Height reaching at length 80 feet, stem-diameter 1 foot.

Arthrostylidium longiflorum, Munro. Venezuela; ascends to 6,000 feet.

Arthrostylidium racemiflorum, Steudel. Mexico; ascends to 7,500 feet. Height 30 feet.

Arthrostylidium Schomburgkii, Munro. Guiana; ascends to 6,000 feet. Height 60 feet.

Arundinaria acuminata, Munro. Mexico. Height 20 feet.

Arundinaria collosa, Munro. Himalaya; ascends to 6,000 feet. Height 12 feet.

Arundinaria debilis, Thwaites. Ceylon; ascends to 8,000 feet. A tall species.

Arundinaria Hookeriana, Munro. Sikkim; ascends to 7,000 feet. Height 15 feet.

Arundinaria Japonica, Siebold and Zuccarini. Japan. Height 12 feet.

Arundinaria Khasiana, Munro. Himalaya; ascends to 6,000 feet. Height 12 feet.

Arundinaria spathiflora, Trinius. The true "Ringal." Himalaya. Height 30 feet. Often confounded with A. falcata.

Arundinaria suberecta, Munro. Himalaya; ascends to 4,500 feet. Height 15 feet.

Arundinaria tessellata, Munro. South-Africa; ascends to 6,500 feet. Height 20 feet.

Aulonemia Quexo, Goudot. New Granada, Venezuela, in cool regions. Tall, climbing.

Bambusa Balcooa, Roxburgh. Bengal to Assam. Height 70 feet.

Bambusa Beecheyana, Munro. China. Height 20 feet.

Bambusa marginata, Munro. Tenasserim; ascends to 5,000 feet. Tall, scandent.

Bambusa nutans, Wallich. Himalaya; ascends to 7,000 feet.

Bambusa pallida, Munro. Bengal to Khasia; ascends to 3,500 feet. Height 50 feet.

Bambusa polymorpha, Munro. Burmah, in the Teak-region. Height 80 feet.

Bambusa regia, Th. Thomson. Tenasserim. Height 40 feet.

Bambusa tulda, Roxburgh. Bengal to Burmah. Height 70 feet.

Bambusa tuldoides, Munro. China, Hong Kong, Formosa.

Beesha capitata, Munro. Madagascar. Height 50 feet.

Beesha stridula, Munro. Ceylon.

Cephalostachyum capitatum, Munro. Himalaya; ascends to 6,000 feet. Height 30 feet.

Cephalostachyum pallidum, Munro. Himalaya; ascends to 5,000 feet. Rather tall.

Cephalostachyum pergracile, Munro. Burmah. Height 50 feet.

Cephalostachyum schizostachyoides, Kurz. Burmah. Height 30 feet.

Chusquea abietifolia, Grisebach. West-Indies. Tall, scandent.

Chusquea capituliflora, Trinius. South-Brazil. Very tall.

Chusquea Colcou, E. Desvaux. Chili. Height 20 feet. Straight.

Chusquea Dombeyana, Kunth. Peru; ascends to 6,000 feet. Height 10 feet.

Chusquea Fendleri, Munro. Central America; ascends to 12,000 feet.

Chusquea Galleottiana, Ruprecht. Mexico; ascends to 8,000 feet.

Chusquea Gaudichaudiana, Kunth. South-Brazil. Very tall.

Chusquea Lorentziana, Grisebach. Sub-tropic Argentina. Height 30 feet; not hollow. Useful for many kinds of utensils and structures.

Chusquea montana, Philippi. Chilian Andes. Height 10 feet.

Chusquea Muelleri, Munro. Mexico; ascends to 8,000 feet. Climbing.

Chusquea Quila, Kunth. Chili. Tall.

Chusquea scandens, Kunth. Colder Central America. Climbing, tall.

Chusquea simpliciflora, Munro. Panama. Height 80 feet. Scandent.

Chusquea tenuiflora, Philippi. Chili. Height 12 feet.

Chusquea uniflora, Steudel. Central America. Height 20 feet.

Dendrocalamus flagellifer, Munro. Malacca. Very tall.

Dendrocalamus Hamiltoni, Nees. Himalaya; ascends to 6,000 feet. Height 60 feet.

Dendrocalamus Hookeri, Munro. Himalaya; ascends to 6,000 feet. Height 50 feet.

Dendrocalamus sericeus, Munro. Behar; ascends to 4,000 feet. Tall.

Dinochloa Tjankorreh, Buese. Java, Philippines; ascends to 4,000 feet. Climbing.

Gigantochloa heterostachya, Munro. Malacca. Height 30 feet.

Guadua capitata, Munro. South-Brazil. Height 20 feet.

Guadua macrostachya, Ruprecht. Guiana to Brazil. Height 30 feet.

Guadua paniculata, Munro. Brazil. Height 30 feet.

Guadua refracta, Munro, Brazil. Height 30 feet.

Guadua Tagoara, Kunth. South-Brazil; ascends to 2,000 feet. Height 30 feet.

Guadua virgata, Ruprecht. South-Brazil. Height 25 feet.

Merostachys Clausseni, Munro. South-Brazil. Height 80 feet.

Merostachys Kunthii, Ruprecht. South-Brazil. Height 30 feet.

Merostachys ternata, Nees. South-Brazil. Height 20 feet.

Nastus Borbonicus, Gmelin. Bourbon; ascends to 4,000 feet. Height 50 feet.

Oxytenanthera Abyssinica, Munro. Abyssinia to Angola; ascends to 4,000 feet. Height 50 feet.

Oxytenanthera albo-ciliata, Munro. Pegu, Moulmein. Tall, scandent.

Platonia nobilis, Munro. New Grenada, colder region.

Pseudostachyum polymorphum, Munro. Himalaya; ascends to 6,000 feet. Very tall.

Teinostachyum Griffithi, Munro. Tall and slender. Referred by Kurz to Cephalostachyum.

Besides these, various others are specially enumerated in the alphabetic sequence of this work. See index also.

Schizostachyum brachycladum, Kurz.

Sunda-Islands and Moluccas. Stems at length 40 feet high, very hollow. The short branches give to this Bamboo a peculiar habit. One variety has splendidly yellow stems.

Schizostachyum elegantissimum, Kurz.

Java; at elevations from 3,000 to 6,000 feet. Unlike all other Bamboos, this bears flowers at an age of three years, and is therefore of special importance for scenic effect. Height 25 feet; stems stout. It requires renewal after flowering, like many allied plants.

Schizostachyum Hasskarlianum, Kurz.

Java. This and S. serpentinum afford the best kinds of Bamboo-vegetables for cookery; the young shoots, when bursting out of the ground, being used for the purpose. Kurz mentions as culinary "Rebong"-Bamboos: Gigantochloa aspera, G. robusta, G. maxima, G. atter. For ornamental culture the same meritorious writer singles out: Schizostachyum brachycladum, the varieties of Bambusa vulgaris, with gaudy and glossy coloring of the stems, in contrast with the black-stemmed species of Phyllostachys from China and Japan.

Schizostachyum irratum, Steudel.

Sunda-Islands and Moluccas. Stems to 30 feet high, remarkably slender.

Schizostachyum Zollingeri, Steudel.

Hills of Java. Much cultivated. Height to 35 feet; stems slender.

Schkuhria abrotanoides, Roth.

From Peru to Argentina. This annual herb yields locally an insecticidal powder.

Schoenocaulon officinale, A. Gray. (*Asa-Graya officinalis*, Lindley; *Sabadilla officinalis*, Brandt and Dierbach.)

Mountains of Mexico. A bulbous-rooted herb with leafless st[em] thus far specially distinct from any Veratum. It furnishes sabadilla-seeds, and yields two alkaloids, veratrin and sabadi[lla]

further a resinous substance, helonin; also sabadillic and veratric acid. The generic names, adopted for this plant by Gray and Dierbach, are coetanous.

Sciadopitys verticillata, Siebold.

The curious "Kooya-maki," or "Kane-Matau," or Umbrella-Fir of Japan. Becoming 140 feet high; pyramidal in habit. Resists severe frosts. Rate of growth in Middle Europe about 15 feet in 20 years [Wolterbeck]. Wood pale and compact, particularly liked as material for waterworks [Luerssen].

Scilla esculenta, Ker. (*Comassia esculenta,* Lindley.)

The Quamash. In the western extra-tropical parts of North-America, on moist prairies. The onion-like bulbs in a roasted state form a considerable portion of the vegetable food, on which the aboriginal tribes of that part of the globe extensively live. This is a pretty plant, and might be naturalised on moist meadows.

Scilla Fraseri, A. Gray.

The Quamash of the Eastern States of North-America. Most prolific in the production of its bulbs, which taste somewhat like potatoes.

Scirpus nodosus, Rottboell.

South-Africa, extra-tropic South-America, New Zealand and extra-tropic Australia. A tufty sedge with widely creeping rhizomes, well fitted to bind driftsand on coasts, even in saline wet places [Ch. French].

Scolymus Hispanicus, Linné.

Countries at or near the Mediterranean Sea. The young roots and tender shoots of this biennial herb serve as culinary vegetable; much like salsify; the aged root acts as a diuretic. S. maculatus (Linné) is a cognate annual species.

Scorzonera crocifolia, Sibthorp.

Greece. A perennial herb; the leaves, according to Dr. Heldreich, used there for a favorite salad and spinach.

Scorzonera deliciosa, Gussone.*

Sardinia, Sicily, Algeria and Tunis. One of the purple-flowered species; equal, if not superior, in its culinary use to the allied salsify. Bears much frost. In its native country this plant yields its root for a favorite confectionery [A. Paillieux].

Scorzonera Hispanica, Linné.*

Middle and Southern Europe, South-Western Asia. In Norway hardy to lat. 63° 26′. The root of this yellow-flowered perennial

herb furnishes not only a wholesome and palatable food, but also serves as a therapeutic remedy much like dandelion. Long boiling destroys its medicinal value [B. Clark]. Kept in a cellar for a while it becomes available for cutting up as admixture to salad [Babo]. Some other kinds of Scorzonera may perhaps be drawn into similar use, there being many Asiatic species; they should be cultivated as annuals. The leaves of some may be used as salad.

Scorzonera tuberosa, Pallas.

On the Volga and in Turkestan, in sandy desert-country. This species also yields an edible root, and so perhaps the Chinese S. albicaulis (Bunge), the Persian S. Scowitzii (Candolle), the North-African S. undulata (Vahl), the Greek S. ramosa (Sibthorp), the Russian S. Astrachanica, the Turkish S. semicana (Candolle), the Iberian S. lanata and S. mollis (Bieberstein). At all events, careful culture may render some of them valuable esculents.

Scutia Indica, Brongniart.

Southern Asia. This, on Dr. Cleghorn's recommendation, might be utilized as a thorny hedge-shrub.

Sebæa ovata, R. Brown.

Extra-tropical Australia and New Zealand. This neat little annual herb can be utilized for its bitter tonic principle (Gentian-bitter). S. albidiflora (F. v. M.) is an allied species from somewhat saline ground. These plants get disseminated most readily, but are unacceptable to stock. S. crassulifolia (Chamisso) and Chironia baccifera (Linné) serve for the same therapeutic purposes in South-Africa [McOwan].

Secale cereale, Linné.*

The Rye. Orient, but perhaps wild only in Afghanistan, and, as recently noted by Dr. A. von Regel, also in Turkestan. Mentioned as one of the hardiest of all grain-plants for sub-arctic and sub-alpine regions. In Norway it can be grown as far north as lat. 69° 30′ [Schuebeler]. There are annual and biennial varieties, while a few allied species, hitherto not generally used for fodder or cereal culture, are perennial. The rye, though not so nutritious as wheat, furnishes a most wholesome well-flavored bread, which keeps for many days, and is most extensively used in Middle and and Northern Europe and Asia. This cereal moreover can be reared in poor soil and cold climates, where wheat will no longer thrive. In produce of grain, rye is not inferior to wheat in colder countries, while the yield of straw is larger, and the culture l exhaustive. It is not readily subject to disease, and can be gr on some kinds of peaty or sandy or moory ground. The so must not be effected at a period of much wetness. Wide s tracts would be uninhabitable, if it were not for the ease of

viding human sustenance from this grateful corn. It dislikes moist ground. Sandy soil gives the best grain. It is a very remarkable fact, that for ages in some tracts of Europe rye has been prolifically cultivated from year to year without interruption. In this respect rye stands favorably alone among alimentary plants. It also furnishes in cold countries the earliest green fodder, and the return is large; but in properly choosing the season it can be brought to mature even in Central Australia [Rev. H. Kempe]. Dr. Sonder observed in cultivated turf-heaths with much humus, that the spikelets produce three or even four fertile florets, and thus each spike will yield as many as eighty beautiful seeds. Langethal recommends for argillaceous soils a mixture of early varieties of wheat and rye, the united crops furnishing grain for excellent bread. When the rye-grains get attacked by Cordyceps purpurea (Fries) or similar species of fungs, it becomes dangerously unwholesome; but then also a very important medicinal substance—namely Ergot—is obtained. The biennial Wallachian variety of rye can be mown or depastured prior to the season of its forming grain. In Alpine regions Wallachian rye is sown with pine seeds, for shelter of the pine seedlings in the first year. Rye-grain is also extensively used for the distillation of gin. Rye-straw serves as paper-material.

Sechium edule, Swartz.

Central America. The Chocho or Chayota. The large starchy root of this climber can be consumed as a culinary vegetable, while the good-sized fruits are also edible. The fruit often germinates before it drops. The plant bears even in the first year, and may ripen one hundred fruits in a year. Cultivated in Jamaica up to 5,000 feet [W. Fawcett]. It comes to perfection in the warmer parts of the temperate zone. Bore fruit in the Botanic Gardens of Melbourne many years ago.

Selago leptostachya, E. Meyer.

South-Africa. There an excellent bush for sheep-pastures in the Karro-grounds, reproduced spontaneously with great readiness from dropping seeds, and maintaining itself also by the running stems. It is the "Waterfinder" of the Orange-river regions, indicating generally humidity beneath the ground [McOwan].

Selinum anesorrhium, F. v. Mueller. (*Anesorrhiza Capensis,* Chamisso and Schlechtendal.)

South-Africa. The root of this biennial herb is edible. A. montana (Ecklon and Zeyher), a closely allied plant, yields likewise an edible root; and so it is with a few other species of the section Anesorrhiza.

Selinum Monnieri, Linné.

Eastern Asia, preferring moist places. An annual herb, praised by the Chinese as valuable for medicinal purposes.

Sequoia sempervirens, Endlicher.* (*Taxodium sempervirens,* Lambert.)

Red Wood or Bastard-Cedar of North-Western America, chiefly California. One of the most colossal trees of the globe, exceptionally becoming 360 feet high, occasionally with a stem-diameter of 55 feet at the base. Likes humidity of soil, particularly in its early youth [Prof. Meehan]. The wood is reddish, soft, easily split, very durable, but light and brittle. The timber of mission-buildings one hundred years old is still quite sound. The growth of this tree is about 32 feet in sixteen years. The tree is often found on metamorphic sandstone. Particularly fit also for calcareous soil [Dr. Masters]. It luxuriates in the cool dampness of sea-fogs. Shinn describes these Sequoias as rugged shafts, rising like huge monolithic columns, crowned with downward curving branches of shining green. Dr. Gibbons writes, that this tree forms forests along the coast-range for a distance of about 200 miles in a belt 20 miles wide. The wood is suitable for external as well as internal finish. It constitutes almost the sole material for weather-boarding along the Californian coast; and for fence-posts, foundations of buildings and railway-sleepers it is almost the only material used there. Is also susceptible of a splendid polish for furniture; is largely sawn into boards and shingles, furnishing in California the cheapest lumber. Stem bare for 100 feet or more; when cut, sending suckers from the root for renovation. Dr. Gibbons records as the stoutest stems some of 33 feet diameter at 3 feet from the ground. The foliage of this Sequoia is much like that of a Fir or Abies, while the foliage of the following species is more resembling that of a Spruce or Picea.

Sequoia Wellingtonia, Seemann.* (*Wellingtonia gigantea,* Lindley; *Sequoia gigantea,* Decaisne, not Endlicher.)

Mammoth-tree. California, up to 8,000 feet above the sea. This, the biggest of all trees, attains a stem-length of 320 feet and a circumference of 112 feet, the age of the oldest trees being estimated at 1,100 years. The total height of a tree has been recorded as occasionally 450 feet, but such heights have never been confirmed by actual clinometric measurements of trees existing now. Traditional accounts seem to have over-rated the height of the Mammoth-tree. In the Calaveras-grove, two of the largest trees, which may have been the tallest of all, were destroyed; the two highest now existing there are respectively 325 and 319 feet high, with a circumference of 45 feet and 40 feet at 6 feet from the ground. In the Mariposa-grove, the highest really measured trees are 272, 9 and 260 feet high; but one of these has the enormous circumference of 67 feet at 6 feet from the ground, while another

height of which is not recorded, is 93 feet in girth at the ground, and 64 feet at 11 feet from it; the branches of this individual tree are as thick as the stems of large elms. The elevation of Calaveras is about 4,760 feet above sea-level. A stump 33 feet in diameter is known at Yosemite. At Tuolumne a stump is tunnelled for the passing through of stage-coaches, the opening being only about one-quarter of the breadth of the stem. According to Dr. Gibbons, this giant of the forest has a far wider range than was formerly supposed, Mr. John Muir having shown, that it stretches over nearly 200 miles at an altitude of 5,000 to 8,000 feet. From the Calaveras to the King-River it occurs in small and isolated groves, but from the latter point south to Deer-Creek, a distance of about 70 miles, there are almost unbroken forests of this noble tree. Growth of the tree about 2 feet a year under ordinary culture, much more in damp forest-glens. Prof. Schuebeler found it to endure the climate of Norway northward to lat. 61° 15′. The wood is soft and white when felled; afterwards it turns red; it is very durable. Both Sequoias produce shoots from the root after the stem is cut away. Well-shaped plants are produced also from cuttings. The genus Sequoia can be reduced to Athrotaxis, as shown by Bentham and J. Hooker.

Serenoa serrulata, J. Hooker. (*Sabal serrulata,* Roemer and Schultes.)

The Saw-Palmetto. South-Carolina, Georgia and Florida; particularly well adapted for sea-coasts. The stem grows to eight feet in height, but according to Mr. A. J. Cook may slimly creep along the ground for 20 feet, sending roots beneath for nourishment. This is a grand honey-plant. Mr. G. Damköhler mentions this Palm as a tan-plant. The leaves can be used for cabbage-tree hats, mats, baskets and other purposes, for which palm-leaves are sought. The fibrous-spongy parts of the stem serve as brushes.

Sesamum Indicum, Linné.*

The Gingili. Southern Asia, extending eastward to Japan, originating according to A. de Candolle in the Sunda-Islands, but according to Dr. Schweinfurth likely of Central African origin. Well known already to Hippocrates [Fraas]. This annual herb is cultivated as far as 42° north-latitude in Japan. The oil, fresh expressed from the seeds, is one of the best for table-use, and free from any unpleasant taste; it congeals far less readily than olive-oil. There are varieties of this plant with white, red and black seeds; the lattter is the earliest and richest, but gives a darker oil. Yield 45 to 50 per cent. oil. Nearly a million acres are under cultivation with this plant in the Madras-Presidency. The export of the oil from Bangkok in 1870 was valued, according to Simmonds, at £183,000; the market value is from 25s. to 35s. per cwt. Ripens well in the milder regions of the colony of Victoria. The plant still succeeds at Malta and Gaza, and is much grown in Turkey. Parched and pounded the seeds make a rich soup. In

Greece the seeds are often sprinkled over cakes. One of the advantages of the culture of this plant consists in its quick return of produce. The soot of the oil is used for China-ink.

Sesbania aculeata, Persoon.

The Danchi. Intra-tropical and sub-tropical Asia, Africa and Australia. This tall annual plant has proved adapted even for desert-regions. Easily grown; the produce heavy. It yields a tough fibre for ropes, nets and cordage, valued at from £30 to £40 per ton. Indian experiments showed the strength 50 per cent. more than the government standard there requires. A rope of $3\frac{1}{2}$ inches thickness broke only at 75 cwt. Stem and branches sought for the best gunpowder-coal [De Rinzi]. The foliage serves as fodder. Several congeneric plants can be equally well utilized.

Sesbania Ægyptiaca, Persoon.

Africa, Southern Asia, Northern and Central Australia, ranging to 33° north in Afghanistan and to 33° degrees south on the Darling River, ascending to 4,000 feet in the Himalayas. By Australian pasturalists called "Pea-Bush." The foliage of this tall perennial herb and of the allied annual S. brachycarpa (F. v. M.) serves as fodder, which cattle are ravenously fond of. According to Mr. T. Gulliver, the green pods, as well as the seeds, are nutritious, wholesome, and of pleasant taste.

Sesbania cannabina, Persoon.

South-Asia. An annual herb of easy growth in wet localities, requiring less attention in weeding and otherwise than the Jute-plant. The crop for fibre ripens in about five months. Regarded by Baker as a variety of S. aculeata, in which case S. cannabina would claim the right of priority for its specific name.

Sesbania grandiflora, Persoon.

North-Western Australia to the verge of the tropics, Indian Archipelagus. A tree up to 40 feet in height. Called in Australia the Corkwood-tree; valuable for various utilitarian purposes. The red-flowered variety is grandly ornamental. The fruit attains occasionally a length of three feet. Dr. Roxburgh recommends the leaves and young pods as an exquisite spinage. The plant is shy of frost. It thrives best at the edge of permanent water. It grew at Port Curtis 12 feet in a year [Edgar].

Seseli Harveyanum, F. v. Mueller.

Australian Alps. A perennial herb. Fruits locally used condiment. [J. H. Maiden].

Sesleria coerulea, Arduino.*

Many parts of Europe, but not in the far northern regions, though in Scotland ascending to 2,500 feet. Of this perennial grass Langethal observes, that it is for dry and loose limestone what Elymus arenarius is for loose sand. It stands depasturing by sheep well, and is one of the earliest grasses of the season.

Sesuvium Portulacastrum, Linné.

All round the globe on the shores of tropical and sub-tropical countries, occurring naturally as far south as Port Jackson. A perennial creeping herb, fit to fix the sandy silt on the edges of sea-coasts.

Shepherdia argentea, Nuttall.

The Buffalo-Berry. From the Missouri to Hudson's Bay. This bush bears red, acidulous, edible berries.

Shorea robusta, Gaertner.

The Sal-tree. India, up to about 3,000 feet. It attains as a maximum a height of 150 feet and a stem-girth of 25 feet. Foliage evergreen: leaves annual. One of the most famed of Indian timber-trees; likes a rather humid clime (about 70 inches rain); thrives in annual extremes of temperature from the freezing point to about 100° F. Drs. Stewart and Brandis found it on sandstone, conglomerate, gravelly and shingly ground, where loose water-transmitting soils are mixed with a large portion of vegetable mould. The climatic conditions within a Sal-area may be expressed as—mean annual rainfall, 40 to 100 inches; mean temperature, in the cool season 55° to 77°, in the hot season 77° to 85° F. The heart-wood is dark-brown, coarse-grained, hard, very heavy, strong, tough, with fibrous cross-structure and fibres interlaced. It requires careful seasoning, otherwise it will rend and warp. For buildings, river-boats and railway-sleepers it is the most important timber of North-India. It exudes a pale aromatic, dammar-like resin. The Tussa-silkworm derives food from this tree.

Shorea Talura, Roxburgh. (*S. laccifera,* Heyne.)

India, abounding in Mysore, where South-European fruits prosper. On this tree also the Lac-insect lives. It furnishes a peculiar dammar.

Silene Cucubalus, Wibel. (*S. inflata,* Smith.)

The Quintcherich. Europe, temperate and colder Asia, North-Africa. A perennial herb, the young shoots of which afford a palatable and wholesome kitchen-vegetable, used like spinage. [Jaeger, Scholtz]. Must be prevented however from straying as weed into culture.

Simaba Cedron, Planchon.

Central-America. As this small tree extends to some plateaux of the Andes, it could doubtless be cultivated without protection in mild climatic regions, also beyond the tropics. The seeds have been brought prominently under notice by Drs. Cheyne, Cespedes and Barrington, as well as Messrs. Jamord and Purdie as a remedy against snake-poison. Professors Restrepo and Dujardin-Beaumetz have drawn as an antipyretic and tonic the powerful Simabin or Cedrin into medicinal use.

Sison Amomum, Linné.

Middle and Southern Europe. An herb of one or two years' duration. It grows best on soil rich in lime. The seeds can be used for condiment.

Smilax bona nox, Linné.

Southern States of North-America and Mexico. The young shoots of this, of S. laurifolia (L.) and some others are edible.

Smilax China, Linné.

Japan and China. Stems of medicinal value; in its native country the young shoots used for food.

Smilax glauca, Walter.

Southern States of North-America, extending into Mexico. One of the Sarsaparilla-plants, regarded by Dr. Porcher of undoubted medicinal efficacy, both sudorific and alterative, containing much smilacin; it likes rich soil.

Smilax medica, Chamisso and Schlechtendal.

Mexico. This plant produces mainly the Sarsaparilla-root of that country. It is one of the richest in smilacin.

Smilax officinalis, Humboldt.

New Granada and other parts of Central America. This climbing shrub produces at least a portion of the Columbian sarsaparilla. S. syphilitica (Willdenow) yields some Brazilian sarsaparilla, S. febrifuga (Kunth) the Purhampui-sarsaparilla of Peru.

Smilax papyracea, Duhamel.

Guiana to Brazil. The origin of the principal supply of Brazilian sarsaparilla is ascribed to this species, although several others of this genus, largely represented in Brazil, may yield the medicinal root also, thus S. Brasiliensis (Sprengel). In warm humid gullies of the temperate zone these plants would probably succeed in establishing themselves. Smilax Australis (R. Brown) extends from the tropical coast-parts of Australia to East-Gippsland. Neither this, nor the East-Australian S. glycyphylla (Smith), nor the N

Zealand Ripogonum scandens (Forster), has ever been subjected to accurate thereapeutic tests, and the same may be said of numerous other Smilaces scattered through the warmer countries of the globe. Even the Italian sarsaparilla, which is derived from the Mediterranean S. aspera (Linné), has been introduced into medicine.

Smilax Pseudo-China, Linné.

South-Eastern States of North-America. This climber likes swampy banks of streams for its habitation. Serves as sarsaparilla locally. The round root is starchy, and when boiled edible; the young shoots serve as asparagus [Dr. Porcher].

Smilax rotundifolia, Linné.

Eastern States of North-America, extending to Canada. A prickly climber with deciduous foliage. An immense local use is made of the roots for the bowls of tobacco-pipes. It is estimated that nearly three millions of these briar-root pipes are now made a year. The reed-portion of these pipes is generally prepared from Alnus serrulata (Willdenow) according to Prof. Meehan.

Smilax rubiginosa, Grisebach.

South-Brazil and La Plata-States. The roots of this and S campestris are there employed as sarsaparilla [Prof. Hieronymus]

Smyrnium Olusatrum, Linné.

The Alisander. Southern Europe, Northern Africa, Western Asia. A biennial herb, which raw or boiled can be utilized in the manner of celery. The roots and fruitlets serve medicinal purposes.

Solanum Aculeastrum, Dunal.

South-Africa. Recommended for hedges, as one of the tallest species of this genus, and as armed with the most formidable prickles.

Solanum Æthiopicum, Linné.

Tropical Africa. Cultivated there and elsewhere on account of its edible berries, which are large, red, globular and uneven. The plant is annual.

Solanum betaceum, Cavanilles. (*Cyphomandra betacea,* Sendtner.)

Central America. This shrub is cultivated as far south as Buenos Ayres and Valparaiso, also on the Mediterranean Sea, for the sake of its tomato-like berries, which are of the size of a duck's egg. Bears about five months each year, and fruits in the second season already. The berries can be eaten raw, when quite ripe, and are of pleasant taste [Morris]; slit up they serve particularly well in mixed salads. Hardy at Port Phillip.

Solanum cardiophyllum, Lindley.

Central Mexico. A Potato-Solanum, with naturally large tubers.

Solanum Commersonii, Dunal.

La Plata-States, in rocky arid situations at a low level. Also a Potato-Solanum. Great hopes are entertained of this species as a new sort of potato. S. Ohrudi and S. collinum are varieties according to Mr. Baker.

Solanum Dulcamara, Linné.

Europe, Northern Africa, Middle Asia, indigenous in Norway to lat. 66° 32′. A trailing half-shrub, with deciduous leaves. The stems are used in medicine, and contain two alkaloids: dulcamarin and solanin. Concerning these ample information is given by Husemann and Hilger in their large work "Pflanzenstoffe" (1884).

Solanum edule, Schumacher and Thonning.

Guinea. The berry is of the size of an apple, yellow and edible. Has borne well at Port Jackson, where the fruit is esteemed as a culinary vegetable [Fred. Turner].

Solanum Gilo, Raddi.

Tropical America; much cultivated there for the sake of its large, spherical, orange-colored berries, which are edible.

Solanum Guineense, Lamarck,

Within the tropics of both hemispheres. The berries of this shrub serve as a dye of various shades, particularly violet, for silk.

Solanum indigoferum, St. Hilaire.

Southern Brazil. A dye-shrub, deserving trial-culture.

Solanum Jamesii, Torrey.

Mountains of the South-Western States of North-America and of Mexico. A potato-bearing species, with small tubers, which however continued cultural care may improve. See Mr. J. G. Baker's review of the tuber-bearing species of Solanum in the Journal of the Linnean Society 1884.

Solanum Lycopersicum, Linné.* (*Lycopersicum esculentum,* Miller.)

The Tomato. South-America, particularly Peru. Annual. Several varieties exist, differing in size, shape and color of the berries. It is one of the most eligible plants with esculent fruit for naturalization in desert-countries. As well-known, the toma[illegible] is adapted for various culinary purposes. Bears well even in t[illegible] hot deserts of Central Australia [Rev. H. Kempe]. Seeds kept a dry and cool place will retain their vitality for about four [illegible]

[Vilmorin]. Export of berries from Bermuda alone in 1871 as much as 672 tons [Sir J. Lefroy]. Tomato-foliage may be placed round fruit-trees, like the equally poisonous potato-leaves, to prevent the access of insects, and an infusion of the herb serves also as an insecticide for syringing, as first adopted by Mr. Sircy. Nevertheless Mr. T. B. Hellier in Capeland actually observed a kind of ladybird-beetle, indigenous and not rare there, to live on the potato- and tomato-plant as also on some other solanaceous plants exclusively, but to leave these for orange-trees infested with Icerya Purchasi, the females depositing their eggs amidst any patches of the bug, their larvæ soon devouring greedily the Icerya. The wing-cases of this Coccionella are black with red spots. It is therefore recommended, to plant Potatoes and Tomatoes close to the suffering Orange-trees, so as to keep the Coccionella in close vicinity. Many kinds of stains, even those from ink, can be removed by Tomatoes [P. W. Bedford]. The plant may sometimes be attacked by the potato-disease, caused by Peronospora infestans.

Solanum macrocarpum, Linné.

Mauritius and Madagascar. A perennial herb. The berries are of the size of an apple, globular and yellow. S. Thonningi (F. Jacquin), from Guinea, is a nearly related plant. S. calycinum (Mocino and Sessé), from Mexico, is also allied.

Solanum Maglia, Molina.

From Chili to the Chonos-Archipelagus along the shores. A Potato-Solanum, with naturally large tubers, which however are formed deeper in the ground than those of the ordinary Potato-plant, nor are they of the same agreeable taste. A hybrid progeny may offer advantages in some directions.

Solanum Melongena, Linné. (*S. ovigerum,* Dunal; *S. esculentum,* Dunal.)

The **Egg-Plant.** Arabia. Ripening still at Christiania like the tomato. A perennial plant, usually renewed in cultivation like an annual. The egg-shaped large berries are known under the name of Aubergines, Bringals or Begoons as culinary esculents. Prepared in France like an omelette. The seeds will keep for several years. Allied plants are S. insanum (L.), S. longum (Roxb.), S. serpentinum (Desf.), S. undatum (Lam.), S. ferox (L.), S. pseudo-saponaceum (Blume), S. album (Dour.), which all bear large berries, considered harmless; but all may not represent well-marked species. Absolute ripeness of all such kinds of fruit is an unavoidable requisite, as otherwise even wholesome sorts may prove acrid or even poisonous. Probably many other of the exceedingly numerous species of the genus Solanum may offer yet good-sized edible berries, irrespective of those mentioned in these pages.

Solanum muricatum, L'Héritier.

The Pepino of Peru. A shrubby species, yielding egg-shaped edible berries, which are white with purple spots, and attain a length of six inches.

Solanum oxycarpum, Schiede.

Central Mexico. A species with very small tubers only in its wild state, which culture may however further develop.

Solanum Quitoense, Lamarck.

Ecuador, Peru. A shrubby plant. The berries resemble small oranges in size, color and even somewhat in taste, and are of a peculiar fragrance. To this S. Plumierii (Dunal) from the West-Indian Islands is cognate, as well as S. Topiro (Kunth) from the Orinoco-region.

Solanum torvum, Swartz.

From the West-Indies to Peru. A shrubby species, with yellow spherical berries of good size, which seem also wholesome. Other species from tropical America have shown themselves sufficiently hardy, to induce us to recommend the test-culture of such kinds of plants. Many of them are highly curious and ornamental. S. sisymbrifolium (Lamarck) of South-America, where it becomes extra-tropical, also yields edible berries.

Solanum tuberosum, Linné.*

The Potato. Andes of South-America, particularly of Chili and Peru, but not absolutely trans-equatorial, as it extends into Bolivia, Ecuador and Columbia. It is also wild in the Argentine-territory, and extends northward into the United States and Mexico, in its variety boreale (S. Fendleri, Gray). In reference to nativity see Sir Joseph Hooker's notes on the wild forms of the potato-plant in the Flora Antarctica ii., 329-332. Alph. de Candolle recently confines the nativity of the true potato-plant to Chili, and distinguishes specifically S. Bridgesii and S. Mandoni, both from Valdivia. As other tuber-bearing Solanums may be mentioned S. demissum (Lindley) and S. Bulbocastanum (Dunal) from Mexico. Dr. Masters draws attention to S. montanum (Linné) from Peru. Mr. J. G. Baker regards as varieties of S. tuberosum: S. etuberosum, S. Fernandezianum, S. immite, S. Columbianum, S. Otites, S. Venezuelæ, S. verrucosum, S. debile, S. stoloniferum, S. utile, S. squamulosum, S. Fendleri. The production of this important esculent is still possible in parts of Iceland, while tests, suggested by the writer of this work, have proved, that as a winter-crop the potato can also yet be had in Central Australia. In Norway, it can be grown as far north as 71° 7′ [Schuebeler]. In the Australian Alps reared successfully to 4,800 feet [J. Stirling]. From some varieties of potatoes three crops may be obtained within a year

regions free from frost. In rich coast-lands of Victoria as much as 14 tons of potatoes have been taken from an acre in a single harvest. As a starch-plant, the potato interests us also on this occasion particularly. Prof. J. H. Gilbert points out, that although richly nitrogenous manures promote much the growth of the Potato-plant, yet the tubers get mainly enriched in starch only. Water, in which potatoes have been boiled, serves against slugs and aphides [H. G. Pratt]. Considering its prolific yield in rich soil, we possess as yet too few factories for potato-starch. This starch, irrespective of its many other uses, is preferentially chosen for calico-printing. The average yield is 10 per cent. Great Britain imported, in 1884, about 14,000 tons of dry yeast, for the manufacture of which potato-starch is largely used, at a value of £777,000. The starch, by being heated with mineral acids or malt, can be converted into dextrin and dextro-glucose for many purposes of the arts. Dextrin, as a substitute for gum, is also obtainable by subjecting potato-starch in a dry state to a heat of 400° F. Prof. Max Cornu recommends syringing with a solution of sulphate of copper (1 to 200) against Peronospora infestans. Alcohol may be largely produced from the tubers. The berries and shoots contain solanin. Baron von Liebig remarks, "So sar as its foliage is concerned, it is a lime-plant; as regards its tuber, a potash-plant." Langethal says, "It surpasses in easy range of cultivation all other root-crops; its culture suppresses weeds and opens up the soil, besides preparing the land for cereals." Seeds of the potato-berries should be sown in adapted places by explorers of new countries, provided the natives can be made to understand, that the berries are poisonous. The most formidable potato-disease of the last forty years, from the Peronospora infestans, seems to have originated from the use of objectionable kinds of guano, with the introduction of which the murrain was contemporaneous; along with this Fung the Fusisporium Solani works almost constantly its mischief also; to destroy their hibernating spores all vegetable remnants on potato-fields must be burnt [W. G. Smith]. The foliage of potato-plants, when thickly placed under trees or shrubs, infected by blight, checks materially the spread of insects, which cause the disease. The most destructive potato-grub is Lita Solanella. The Colorado-beetle, injurious to the potato-crop in North-America, is Doryphora decemlineata.

Solanum Uporo, Dunal.

In many of the islands of the Pacific Ocean. This shrub has proved hardy at Port Phillip. The large red spherical berries can be used like tomatoes. The leaves, macerated in cold water, render it quickly mucilaginous, and the liquid thus obtained is regarded as valuable against dysentery [Rob. MacDougall].

Solanum vescum, F. v. Mueller.

The Gunyang. South-Eastern Australia, extending to Tasmania. A shrub, yielding edible berries, which need however to be fully ripe for effecting absence of deleterious properties.

Sophora Japonica, Linné.

A deciduous tree of China and Japan, resembling the Laburnum, at length 60 feet high. Hardy in Middle Europe. Wood hard and compact, valued for turners' work. All parts of the plant purgative; the flowers rich in yellow dye, used for silk. The variety pendula, desirable for cemeteries; when trained as a creeper, it has few rivals in handsomeness.

Sophora tetraptera, J. Miller.

New Zealand, Lord Howe's Island, Juan Fernandez Island, Chili, Patagonia. The "Pelu" of the latter countries. A small tree, with exceedingly hard and durable wood, which can be used for cog-wheels and other select structures. Trunk exceptionally attaining a diameter of three feet. The wood differs much from that of S. Tomairo of the Easter-Island [Dr. Philippi].

Spartina cynosuroides, Willdenow.

Eastern part of North-America, there often called Prairie-grass. A perennial grass of fresh-water swamps; it can be utilized for fodder, and its value as paper-material seems almost equal to that of Esparto. Emits shoots copiously, hence is recommended by Bouché for binding maritime driftsands, covering the ground densely with its persistent rigid foliage.

Spartina juncea, Willdenow.

Salt-marshes of North-America. A grass with creeping roots: it can be utilized to bind moist sand on coasts. A tough fibre can readily be obtained from the leaves. S. polystachya (Willdenow) is a stately grass, adapted for saline soil; it is also a North-American species. S. juncea and S. cynosuroides extend to Canada [J. Macoun].

Spartina stricta, Roth.

The Twin-spiked Cord-grass. Countries on the Mediterranean Sea, extending to Britain and also to North-America. A rigid perennial with creeping roots, recommended for fixing and rendering solid any mud-flats on low shores and at the mouths of rivers; only suitable for brackish ground.

Spartium junceum, Linné.

Countries around the Mediterranean Sea, thence to the Cana Islands, Styria and Persia. This bush yields a textile fibre, whi. was in prominent use already with the ancients. The flower which are very fragrant, provide a yellow dye.

Spergula arvensis, Linné.

All Europe, North-Africa, West-Asia. The "Spurrey." This annual herb, though easily becoming a troublesome weed, is here mentioned for the desirable completeness of this enumeration. The tall variety with large seeds (S. maxima, Weihe) can be chosen with advantage for the commencement of tillage on any sandy soil too poor for barley. It takes up the land only for about two months, if grown for green fodder, and as such much increases the yield of milk. It serves also for admixture to hay [Langethal]. It is one of the earliest of fodder plants, and imparts a particularly pleasant taste to butter. One of the best plants for green manure. On pastures it proves an effective vermifuge.

Spigelia Marylandica, Linné.

The "Pinkroot" of North-Eastern America, north to Pennsylvania and Wisconsin. A perennial handsome herb, requiring cautious administration as a vermifuge. S. anthelmia, L., is an annual pretty plant of tropical America, and possesses similar medicinal properties, in which probably some others of the many species of this genus likewise share.

Spilanthes oleracea, N. Jacquin.

South-America. Inaptly called the "Para-Cress." An annual herb of considerable pungency, used as a medicinal salad.

Spinacia oleracea, Linné.*

Siberia. The ordinary spinach, an agreeable culinary annual or biennial of rapid growth. Can be grown in Norway to lat. 70° 4′ [Schuebeler]. It has a mild aperient property, like several species of Chenopodium. Two varieties are distinguished, the Summer- and the Winter-Spinach, the former less inclined to run into seed, but also less hardy. Mœnch recognises two species, S. inermis and S. spinosa. The seeds are found by Burbridge and Vilmorin to retain their vitality for about five years.

Spinacia tetrandra, Steven.

The "Schamum." From the Caucasus and Persia to Turkestan and Afghanistan. Also an annual and unisexual plant like the preceding, with which it has equal value, though it is less known. A. de Candolle surmises, that it may be the original parent of the Spinage-plant.

Spinifex hirsutus, La Billardière.

On the whole coast of extra-tropical Australia. Highly valuable for binding coast-sand with its long creeping roots; deserving transfer to other parts of the world with mild clime.

Spinifex longifolius, R. Brown.

On the tropical and western extra-tropical coast of Australia. Available like the former.

Spinifex paradoxus, Bentham.

Central Australia. Not unimportant as a large perennial fodder-grass on sand-ridges, and remarkable for its endurance of protracted drought and extremely high temperature [Flierl].

Spinifex squarrosus, Linné.

India. Useful for binding sand. Tennant remarks, that the radiating heads become detached when the seed is matured, and are carried by the wind along the sand, over the surface of which they are impelled by their elastic spines, dropping their seeds as they roll along. The heads are so buoyant as to float lightly on water, and while their uppermost spiny rays are acting as sails, they are carried across narrow estuaries, to continue the process of embanking beyond on any newly formed sandbars.

Spondias dulcis, G. Forster.

Polynesia, perhaps also Philippine Islands. This noble tree is introduced into this indicative list, with a view of showing the desirability, that trials should be instituted as regards the culture of the various good fruit-bearing species of this genus, one of which, S. Solandri (Bentham), crosses the tropical circle in East-Australia. The lamented Dr. Seemann saw S. dulcis 60 feet high, and describes it as laden with fruits of agreeable apple-flavor, called "Wi," some attaining over 1lb. weight. Matures its fruits copiously in subtropic East-Australia, where it is made much into preserves [Edgar].

Spondias lutea, Linné.

West-Indies, extending to Venezuela, in Jamaica up to an elevation of about 4,000 feet. Fruit at all events available for some farm-animals.

Spondias mangifera, Willdenow.

Continental and insular India, ascending the Himalayas to about 5,000 feet. A small tree with deciduous foliage and edible fruit, the latter of the size of a small mango, but of austere taste.

Sporobolus Virginicus, R. Brown.

Warmer regions of both hemispheres. A perennial grass, whi will luxuriate even in sandy maritime places, and keep perfec green after three or four months' drought. In Jamaica hor become rapidly and astonishingly fat while feeding upon this g [Jenman]. S. indicus, S. purpurascens (Hamilton) and S. Ja

monti (Kunth) are also highly spoken of as pasture-grasses in the West-Indian Islands. Dr. Bancroft found one species to luxuriate particularly within tide-marshes of sub-tropic Australia as pasturage. Several other congeners deserve attention, but S. elongatus (Brown), though a very resisting grass, is rather too hard for fodder-purposes.

Stachys tuberifera, Naudin. (*S. affinis,* Bunge.)

North-China. Illustrated in the *Gardeners' Chronicle* of January, 1888. The tubers of this herb are the "Crosnes" of the Parisian markets. They are small, but produced in great numbers. Mr. P. Middleton recommends the tubers as an admixture to salad, as material for pickles and as a companion to radish; also excellent in a fried state. They are very nourishing and easily digestible. When fresh they contain about 16 per cent. galactan. The roots bearing frost well, can be relied on for fresh vegetable even in an English mid-winter. They can be left in the ground even during the coldest weather. The yield of tubers is comparatively large: as much as 4 tons have been raised from an acre. Can in porous soil remain unattended to for years. Prof. Naudin remarks, that the plant accommodates itself to all sorts of soil. It is the most easily cultivated of all kitchen-vegetables, but difficult to eradicate. Only fit for culture in cold regions. The tubers are planted 9 to 12 inches apart, in rows about 2 feet distant. Introduced by Mons. Pailleux.

Stenópetalum nutans, F. v. Mueller.

Central Australia. An excellent annual herb for sheep-pastures, disseminating itself over the ground readily [Rev. H. Kempe]. The naturalization of other species, all Australian, might be effected in arid hot sandy deserts.

Stenotaphrum dimidiatum, Trinius.* (*S. Americanum,* Schrank).

South-Asia, North-Australia, Africa, warmer countries of America; not known as really indigenous from any part of Europe. Here called the Buffalo-grass. It is perennial, creeping, and admirably adapted for binding sea-sand and loose soil of river-banks, also for forming garden-edges, and for establishing a grass-sward on lawns much subjected to traffic. Generally not liked by pasture-animals, and for this very reason all the more eligible for consolidating rolling coast-sand. It keeps alive in the hottest and driest regions of Central Australia, where it was first introduced by the writer of this work; it endures also some frost, even the tender portions of its blade, and has shown itself adapted for recently reclaimed swamp-land. The chemical analysis, instituted late in spring, gave the following results:—Water, 80·25; albumen, 0.50; gluten, 5·44; starch, 0·08; gum, 1·60; sugar, 1·60; fibre, 10·53 [F. v. Mueller and L. Rummel]. It was this grass, which

Mr. John C. Bell reared with so much advantage for fodder on the bare rocks of the Island of Ascension; and it was there, where Australian Acacias took the lead, to establish wood-vegetation and to secure permanency of drinking-water. S. subulatum (Trinius) is a closely allied grass of New Guinea and some of the adjoining islands.

Sterculia Carthagenensis, Cavanilles. (*S. Chicka,* St. Hilaire.)

South-Brazil. This and some other South-American species furnish seeds of almond-like taste. The co-ordinal Pterygota basiloxylon (F. v. M.) of Brazil is praised for its valuable wood.

Sterculia nobilis, Smith.

From India to China. A middle-sized spreading tree. The rather large seeds can be used as chestnuts in a roasted state.

Sterculia quadrifida, R. Brown.

Eastern and Northern Australia. This tree might be naturalized in rich and humid forest-regions within mild climes. It is the "Calool" of the natives. The black seeds are of filbert-taste, like those of some other *Sterculiæ*. As many as eleven of the brilliantly scarlet large fruitlets may occur in a cluster, and each of them may contain as many as ten or eleven seeds [Ch. Fawcett]. The fruit is almost alike to that of S. nobilis in size and color.

Sterculia urens, Roxburgh.

India, extending to the north-western provinces, to Assam and Ceylon. A tree with deciduous foliage; likes dry, rocky, hilly situations. This and S. urceolata (Smith), from the Moluccas and Sunda-Islands, produce edible seeds, and may prove hardy in mild extra-tropical regions. The same may be said of S. foetida (Linné), which extends from India to tropical Africa and North-Australia.

Stilbocarpa polaris, Decaisne and Planchon.

Auckland's and Campbell's Islands, also in the southern extremity of New Zealand and in Macquarie's Island, luxuriating in the frigid zone and in exposed, boisterous localities. An herbaceous plant with long roots, which are saccharine, and served some wrecked people for a lengthened period as sustenance. The plant is recommended here for further attention, as it may prove through culture a valuable addition to the stock of culinary vegetables of cold countries. Herbage liked by some pasture-animals.

Stillingia silvatica, Garden.

The Yaw-Shrub. Southern States of North-America. The ro extensively utilized there for its emetic and purgative properti

Stipa aristiglumis, F. v. Mueller.

South-Eastern Australia, in the dry inland-regions. Graziers consider this perennial grass as very fattening and as yielding a large quantity of feed. Its celerity of growth is such that, when it springs up, it will grow at the rate of 6 inches in a fortnight. Horses, cattle, and sheep are extremely fond of it. It ripens seeds in little more than two months, should the season be favorable.

Stipa Jarava, Beauvois. (*S. Ichu,* Kunth.)

Peru, in the cooler regions. Mentioned specially as a good pasture-grass there by Prof. J. A. de los Rios.

Stipa setigera, Presl.

From Oregon, California and Texas to Western South-America. Prof. Brewer pronounces this the most common and one of the best bunch-grasses of California.

Stipa tenacissima, Linné.* (*Macrochloa tenacissima,* Kunth.)

The Esparto or Atocha, called also Alfa. Spain, Portugal, Greece, North-Africa, ascending the Sierra Nevada to 4,000 feet, common also on the arid plateau of Algeria. This grass has become celebrated for some years, having already afforded a vast quantity of material for British paper-mills. During 1870 the export of Esparto-ropes into England was 18,500 tons, while the raw material to the extent of about 130,000 tons was imported. In 1889 Great Britain imported of Esparto and other vegetable fibres for paper-mills 385,000 tons, representing a value of over two million pounds sterling. It is tall and perennial, and would prove a valuable acquisition anywhere, inasmuch as it lives on any kind of poor soil, occurring naturally on sand and gravel, as well as on clayey, calcareous or gypseous soil, and even on the very brink of the coast. Possibly the value of some Australian grasses, allied to the Atocha, may in a like manner become commercially established; and mainly with this view paper-samples of several grass-kinds were prepared by the writer. (See "Report Industrial Exhibition, Melbourne, 1867.") Even in the scorching heat of the forbidding Sahara-region the Atocha maintains itself, particularly where the soil is somewhat calcareous, and it may thus yet be destined to play an important part in the introduced vegetation of any arid places of desert-tracts, particularly where lime and gypsum exist. The very tenacious fibre resists decay, and is much employed for the manufacture of ropes, also for baskets, mats, hats and other articles. Extensive culture of this grass has commenced in the south of France. It is pulled once a year, in the earlier part of the summer. The propagation can be effected from seeds, but is done usually by division of the root. Ten tons of dry Esparto, worth from £4 to £5 each, can be obtained from an acre under favourable circumstances. The supply has fallen short of the

demand. Good writing-paper is made from Esparto without admixture; the process is similar to that for rags, but cleaner. The price of Esparto-paper ranges from £40 to £50 for the ton. The worlds requirements of material for paper-mills is now annually such as to turn out about 3,000,000 of tons of paper. Stipa arenaria (Brotero) is a closely allied and still taller species, confined to Spain and Portugal. Consul W. P. Marks and Mr. G. Noble deserve great praise for having brought the Atocha into commercial and manufactural recognition. Mr. Christy notes, that half its weight consists of fibre, fit for paper-mills. See further his important publications on new commercial plants. Stipa pennata, S. capillata and S. elegantissima will grow in pure sand, are pretty for bouquets; the latter liked by pasture-animals [G. Simpson]; it grows best on lime-stone soil.

Streblus asper, Loureiro.

South-Asia. This bears a good recommendation for live fences, being a shrub of remarkable closeness of branches.

Strophanthus Kombe, Oliver.

Tropical Africa. A somewhat climbing shrub, which likely would accommodate itself to sub-tropic regions. The seeds, which contain the alkaloid Strophanthin, have come into therapeutic use; this may give a clue to possible efficacy of various congeneric or co-ordinal plants, S. hispidus (De Candolle) having already in this respect established its position in cardial diseases [Prof. Fraser].

Stylidium Vitiense, F. v. Mueller. (*Marlea Vitiensis,* Bentham.)

Fiji, Queensland and New South Wales. A middle-sized tree, generally with a gouty trunk. Wood bright-yellow, with fine undulating rings, black towards the centre. Fruit edible [P. O'Shanesy]. The generic name Stylidium by Loureiro has many years priority over that of Marlea by Roxburgh.

Stylosanthes elatior, Swartz.

South-Eastern North-America, West-Indies. A perennial herb possessing valuable medicinal properties, sedative and tonic [Dr. E. Sell].

Styrax officinalis, Linné.

Countries on the Mediterranean Sea. A tall bush or small tree. The fragrant solid storax-resin exudes from this plant, or is particularly obtained by pressure of the bark.

Swertia Chirata, Hamilton. (*Ophelia Chirata,* Grisebach.)

From Kashmir to Bootan and Khasia, at elevations from 4,000 10,000 feet. A perennial herb, considered as one of the best toni it possesses also febrifugal and antarthritic properties. Its ad

istration in the form of an infusion, prepared with cold water, is the best. Besides S. elegans (Wallich) and some of the other Upper Indian, Chinese and Japanese species probably deserve equal attention. Hanbury and Flückiger mention as chiratas or chirettas of Indian Bazaars: S. angustifolia (Hamilton), S. densifolia (Grisebach) and S. multiflora (Dalzell), besides species of Exacum and Andrographis. All come from the cooler uplands. C. B. Clarke speaks of S. lurida and S. alata (Royle) as closely allied to the genuine chirata.

Swietenia Mahagoni, Linné.*

The Mahogany-tree of the West-Indies, extending naturally to Florida and Mexico. The degree of endurance of this famous tree seems not sufficiently ascertained. In its native mountains it ascends to 3,000 feet. In Jamaica it hardly reaches an elevation of 2,000 feet [W. Fawcett]. Prospers in Natal [J. M. Wood]. At Port Curtis the tree grows perfectly well [Edgar]. Requires rich soil. It reaches a considerable height, and the stem a diameter of 6 or 7 feet, indicating a very great age. Sir William Hooker counted 200 wood-rings in a block of 4 feet width, which may not however indicate as many years of age. The importation of Mahogany-wood into the United Kingdom in 1884 amounted to 62,000 tons at a value of £562,000. S. macrophylla (King) of Honduras has the wood not so dark as the genuine Mahogany, flowers earlier and seeds more copiously [J. S. Gamble]. Degree of climatic endurance not yet ascertained.

Symphytum officinale, Linné.

The Comfrey. Europe, Western Asia. A perennial herb. The root is utilized chiefly in veterinary practice.

Symphytum peregrinum, Ledebour.*

The prickly Comfrey. Caucasus and Persia. The growth of this hardy plant may be recommended as an adjunct to lupine-culture. The Hon. Arthur Holroyd of Sydney has recently devoted a special publication to this plant. He quotes on seemingly good authority the return of foliage even in the first year as 20 tons to the acre, in the second year 50 tons, and every year after the astonishing quantity of 80 to even 120 tons on richly manured land. Anyhow this herb yields a nutritive and relished foliage in rapid and continuous reproduction. It is likewise recommended for green manure. Dr. Curl observed it to grow well in the moist climate of New Zealand during the hottest and driest as well as coldest weather. Fit especially for sub-alpine country. Dr. Voelcker found much mucilage but little sugar in this plant. The massive root, known to penetrate to a great depth, sometimes to fully 9 feet, sustains the plant in vigor, allowing it to be cut almost throughout the year. The propagation is easy from root-cuttings,

difficult from seeds; 4,000 of the former to an acre; it will thrive even in sand and tough clay, but prefers moist and even boggy land. It ought to be naturalized along swamps, lagoons and river-banks. It can be dried for hay. Finally it is recommended as a plant for game. It ought to suit well for ensilage. In tropical countries cattle have a predilection for it; there it likes shade. The plant has not satisfied the expectations set on it in Victoria. The likewise borragineous Cynoglossum Morrisonii (De Candolle), of North-America, yields three cuttings annually. Horses and cattle relish it. Cattle are very fond also of the ordinary Borage of Europe, Borago officinalis (Linné).

Symplocos ramosissima, Wallich.

Himalayas, up to 7,500 feet. In Sikkim, according to Dr. Stewart, the yellow silkworm is reared on the leaves of this tree. Two allied species occur spontaneously in the forests of East-Australia far south, many in Southern Asia, several in tropical America.

Syncarpia laurifolia, Tenore. (*Metrosideros glomulifera,* Smith.)

Queensland and New South Wales. Vernacular name, Turpentine-tree; attains a height of 200 feet, with a stem to 30 feet in girth; rather of quick growth; well adapted to shade road-sides. The wood is very durable, mostly used for flooring and cabinet-making, as it takes a high polish [Hartmann]; extremely durable, of excellent qualities [A. McDowall].

Synoon glandulosum, A. de Jussieu.

New South Wales and South-Queensland. This tall evergreen tree deserves cultivation in sheltered warm forest-valleys on account of its rose-colored easily worked wood. Some species of Dysoxylon of East-Australia also produce rose-wood, for instance, D. Fraseranum (Bentham), of New South Wales, a tree reaching 100 feet in height and 3 feet in stem-diameter, with fragrant wood, and D. Muelleri (Bentham), 80 feet high; the wood of the last-mentioned species is of a rich color, valuable for cabinet-work, and fetches in Brisbane £3 to £4 per 1,000 feet [W. Hill].

Syringa vulgaris, Linné.

The Lilac. Asia Minor and Persia. This popular shrub can be reckoned among the calendar- and scent- plants. Keeping its odor well in bouquets. The Syringin, discovered by Bernays, has been introduced into medicine [Merck]. For chemical particulars about this glycosid refer to Husemann and Hilger's Pflanzenstoffe 1884.

Tacca pinnatafida, I. R. & G. Forster.

From India to tropical Australia and Polynesia, also in Madagascar. This perennial plant will live even on sand-shores. From the tubers of this herb the main supply of the Fiji-arrowroot is prepared. It is not unlikely, that this plant will endure a temperate climate. The Tacca-starch is much valued in medicine, and particularly used in cases of dysentery and diarrhœa. Its characteristics are readily recognised under the microscope. Several other kinds of Tacca are distinguished, but their specific limits are not yet well ascertained. From the leaves and flower-stalks light kinds of bonnets are plaited. A Tacca, occurring in Hawaia, yields a large quantity of the so-called arrowroot exported thence. Other species (including those of Ataccia) occur in India, Guinea, Guiana and North-Brazil, all deserving tests in reference to their hardiness and their value as starch-plants.

Tagetes glanduligera, Schranck.

South-America. This vigorous annual plant is said by Dr. Prentice to be pulicifugous.

Talinum patens, Willdenow.

From Mexico to Argentina. A perennial succulent herb, which might easily be naturalized on coast- and river-rocks. It furnishes the "Puchero" vegetable. The Talinum-species can all be placed well enough into the genus Claytonia.

Tamarindus, Indica, Linné.

Tropical Asia and Africa. This magnificent, large, expansive tree ranges northward to Egypt, and was found in North-Western Australia by the writer of this list; reaches a very great age. Final stem-girth of 25 feet not rare. Never leafless. Varieties occur, according to Brandis, with sweetish red pulp. It is indicated here not without hesitation, to suggest trials of its acclimation in regions of the temperate zone with a warm, humid and equable temperature. In East-Australia, slightly outside the tropics it bears still abundantly, and it remains hardy at all events as far south as Moreton-Bay. In some situations it is attacked by boring insects [Edgar]. The acid pulp of the pods forms the medicinal tamarind, rich in formic and butyric acid, irrespective of its other contents; cold made into a syrup, it can be kept for preparing an acidulous beverage.

Tamarix dioica, Roxburgh.

India, up to 2,500 feet. An important shrub for binding newly formed river-banks, even in saline soil.

Tamarix Gallica, Linné.*

Southern Europe, Northern and tropical Africa, Southern and Eastern Asia, ascending the Himalayas to 11,000 feet; hardy still

at Christiania. Attains a height of 30 feet in Algeria, according to Cosson. Adapts itself in the most extraordinary manner to the most different localities. It will grow alike in water and the driest soil, also in salty ground, and is one of the most grateful and tractable plants in culture; it is readily multiplied from cuttings, which strike root as easily as a willow, and push forth stems with unusual vigor. Hence it is one of the most eligible bushes for planting on coast-sand, to stay its movements, or for lining embankments. Furnishes material for a superior charcoal [W. H. Colvill] and various implements [Brandis]. Yields in its native countries a kind of manna and of gall. According to Dr. Aitchison much employed for all sorts of basket- and wattle-work in Afghanistan. The red bark of the branches renders handles from them very pretty, which can be said also of T. macrocarpa (Bunge). Planted much in cemeteries. The period of flowering can be altered by the extent and time of pruning. In Australia first largely sent out by the writer.

Tamarix Germanica, Linné.

Europe and Western Asia, extending to about 15,000 feet into the Himalayas; hardy in Norway to lat. 70° 20′ [Schuebeler]. Likewise available for arresting the ingress of shifting sand, particularly in moist places, also for solidifying precipitous river-banks. The allied T. elegans (Myricaria elegans, Royle) attains a height of 20 feet.

Tamarix orientalis, Forskael. (*T. articulata,* Vahl).

Northern and Middle Africa, Southern Asia. A fast-growing tree, attaining a height of 60 feet, the trunk occasionally enlarging to a circumference of 12 feet. Springs up readily from seeds, and is also easily propagated from cuttings. Coppices well. The wood serves for ploughs, wheels and many implements [Stewart and Brandis]. With T. Gallica it grows with sufficient rapidity, to be reared in India for fuel. Dye-galls and a kind of manna are also produced by this tree. The same or an allied species extends to Japan.

Tamarix tetragyna, Ehrenberg.

From Egypt to Afghanistan. This is prominently fit for saline soil, so much so as to be turned to use for Barilla. Most kinds of pasture-animals like to browse on these sorts of plants, but should not have them as exclusive feed [Aitchison].

Tanacetum vulgare, Linné. (*Pyrethrum vulgare,* Boissier.)

The Tansy. Northern and Middle Europe, Northern Asia, Nor Western America. A perennial herb of well-known medic value, which mainly depends on its volatile oil. One of over kinds of plants, ordered to be grown in the gardens of Charle Great already.

Taraxacum officinale, Weber.

"Dandelion." In most of the temperate and cold parts of the globe, but apparently not a native of Australia. It lives in Norway northward to lat. 71° 10′ [Schuebeler]. This well-known plant is mentioned, as it can be brought under regular cultivation, to obtain the medicinal extract from its roots. It is also considered wholesome to grazing animals. The young leaves furnish a medicinal salad. It is also an important honey-plant and flowers early in the season.

Tarchonanthus camphoratus, Linné.

South-Africa. This bush deserves attention, being of medicinal value. As an odorous garden-plant it is also very acceptable.

Taxodium distichum, Richard.*

Virginian Swamp- or Bald-Cypress. In swampy places of Eastern North-America, extending from 38° to 47° north latitude. Thought to attain occasionally an age of 2,000 years; wood-rings to the number of about 4,000 have been counted, but perhaps these not all fully annual. A valuable tree, 100 feet high or more, sometimes with a stem circumference of 40 feet above the conical base; of rapid growth; foliage deciduous, like that of the Larch and Ginkgo. Important as antimalarian for wet fever-regions. It is found fossil in the miocene formation of many parts of Europe. The wood is fine-grained, hard, strong, light, elastic and very durable; splits well; it is much used for shingles, rails, cabinet-work and planks; it is almost indestructible in water. The tree requires a rich soil, a well-sheltered site, with much moisture but also good drainage [Lawson]. It yields a superior kind of turpentine, and thus also much oil on distillation. Useful for avenues on swampy margins of lakes or river-banks. Dr. Porcher says, "This tree, lifting its giant-form above the others, gives a striking feature to many of the swamps of Carolina and Georgia; they seem like watch-towers for the feathered race."

Taxodium mucronatum, Tenore.

The famed Montezuma-Cypress of Mexico; to 120 feet high, with a trunk reaching 44 feet in circumference; it forms extensive forests between Chapultepec and Tescuco.

Taxus baccata, Linné.

Yew. Europe, North-Africa and Asia, in the Himalayas up to 11,000 feet elevation. In Norway it extends northward to lat. 67° 30′ (indigenous); Professor Schuebeler found it to attain still a height of 45 feet and a circumference of 4 feet in lat. 59° 26′. Generally a shrub, finally a tree as many as 100 feet high; it furnishes a yellow or brown wood, which is exceedingly tough, elastic and durable, and much esteemed by turners; one of the

best of all woods for bows. Simmonds observed, that "a post of yew will outlast a post of iron." Much valued also for pumps, piles and water-pipes, as more lasting than any other wood; also for particular musical instruments, the strongest axletrees and select implements. The tree is of very slow growth, but attains a great age, perhaps three thousand years; some ancient ones are known with a stem of 50 feet in girth; wood-rings to the extent of 2,880 have been counted. In the *Garden* it is stated, that a yew, still existing at the Fountain-Abbey in Yorkshire, was already in 1132 a large tree, when this monastry was founded. A Taxus at Tisbury, in Dorsetshire, had a stem-circumference of 37 feet; one at Fortnigal, in Perthshire, had before its mutilation a stem-circumference of 52 feet. It should be kept out of the reach of grazing animals, as leaves and fruit are deadly poisonous. In England the tree has lately become subject to destructive attacks of a fungus, the Sphaerella Taxi (Cooke). Some horticulturists cut the yew fancifully into various shapes. The boughs afford some of the best of living greens for garlands and other decorative purposes. T. cuspidata (Siebold) is a closely cognate Japan-Yew.

Taxus brevifolia, Nuttall. (*T. Lindleyana,* Lawson.)

Western Yew. North-Western America. A stately tree, finally to 75 feet high, with a stem to 5 feet in circumference. Wood beautifully whitish or slightly yellow or rose-colored, tough, very hard and remarkably elastic; as fine and close-grained as that of the European Yew. The savages use it for their bows. Sir Joseph Hooker regards this as well as the Japanese and some other yews all as forms of one species.

Tectona grandis, Linné fil.*

The "Teak" of South-Asia. This superb timber-tree has its northern limit in Bandalkhand, at elevations of 3,000 feet; it ascends to 4,000 feet, but is then not of tall size; it extends to the Sunda-Islands and New Guinea; likes rather open forest-land. In Western India, according to Stewart and Brandis, frost is not uncommon in the teak-districts. In eastern subtropic Australia it has produced fruits, from the seeds of which new trees have been raised. The leaves drop annually. Teak-wood is held in the highest esteem by ship-builders; for the backing of ironclad men-of-war preferred to any other wood; also used for the panels of coaches, and for various other select purposes unsurpassed. It scarcely shrinks. Price now in London £15 for 50 cubic feet.

Tectona Hamiltoniana, Wallich.

Lower India, yields the Burma-wood, which is heavy, cl grained, streaked and susceptible to a high polish. In habit size it is similar to the ordinary Teak [Kurz], but perhaps r hardy.

Teinostachyum attenuatum, Munro.

One of the hardier Bamboos of Ceylon, there growing on the mountains at elevations between 4,000 and 6,000 feet. It attains a height of about 25 feet. Three species of this genus from New Caledonia have been described as Greslanias. Doubtless Mr. Th. Christy's use of "Thiolyte" (value £8 10s. per ton) would be particularly applicable also for converting the foliage of many kinds of Bamboos into paper-pulp; it has a most remarkable effect on fibres for separating and cleansing, and it prevents oxydation, when green parts of plants are boiled under high pressure.

Telfairia pedata, Hooker.

Mozambique. A cucurbitaceous climber with perennial stems, attaining sometimes a length of fully 100 feet, bearing fringed lilac flowers of extraordinary beauty, and fruits attaining occasionally a weight of 60 lbs. and a length of 3 feet, containing at times as many as 500 large seeds. The latter in a boiled state are edible, or a large quantity of oil, fit for the table, can be pressed from them. The root is carnulent. A second huge species of similar use, T. occidentalis (J. Hooker), occurs in Guinea. The genus-name Joliffia is coetaneous, if not anterior. These superb plants may not be absolutely restricted to hot tropical lowlands, and therefore possibly endure a warm temperate clime.

Terfezia leonis, Tulasne. (*Cheiromyces leonis,* Tulasne.)

Southern Europe, Northern Africa. This edible truffle, together with other species of this and other genera, is deserving of wide naturalisation.

Terminalia Buceras, J. Hooker. (*Bucida Buceras,* Linné.)

From the Antilles to Brazil. One of the Mangrove-trees living in salt-water. Possibly hardy and calculated to consolidate mud-shores. The Tussa-silkworm inhabits, among other trees, several Terminalias.

Terminalia Catappa, Linné.

India, continental as well as insular, ascending only lower mountain-regions, also North-Eastern Australia. Few trees, as stated by Roxburgh, surpass this in elegance and beauty. We have yet to learn, whether it can be naturalized in temperate climes, which it especially deserves for its nuts. It proved hardy as far south as Moreton-Bay [Fr. Turner]. Well suited also for sea-beaches. The seeds are almond-like, of filbert-taste and wholesome; they are most palatable when toasted. The astringent fruits of several other species constitute an article of trade, sought for a lasting black dye. T. parviflora (Thwaites) forms a large tree in Ceylon, at elevations up to 4,000 feet. Several of their congeners reach extra-tropic latitudes in Eastern Australia.

Terminalia Chebula, Retzius.

On the drier mountains of India, ascending to 5,000 feet, thence to Upper Persia. A tree, rising to about 100 feet. The seeds are of hazel-taste; the galls of the leaves and also the young fruits, the latter known as Myrobalans, serve for superior dye and powerful tanning material. Some of its congeners answer the same purpose, among them T. Belerica (Roxburgh), which extends to Persia.

Terminalia tomentosa, Wight and Arnott.

India, ascending to 4,000 feet. A tree, attaining to 100 feet height, of easy dissemination. Important for rearing particular silkworms [Dr. Schlich].

Tetragonia expansa, Murray.

The New Zealand Spinach, occurring also on many places of the coast and in the desert-interior of Australia. Known further from New Caledonia, China, Japan and Valdivia. An annual herb, useful as a culinary vegetable, also for binding drift-sand. It produces its succulent branches and leaves even in the hottest weather and driest localities [Rhind]. Rapid in growth. The seeds will keep fully five years [Vilmorin].

Tetragonia implexicoma, J. Hooker.

Extra-tropical Australia, New Zealand, Chatham-Island. A frutescent, widely expanding plant, forming often large natural festoons, or trailing and climbing over rocks and sands, never far away from the coast. As a spinach-plant it is of not less value than the preceding species. It is well adapted for the formation of bowers even in arid places; it also helps to bind sand. T. trigyna (Banks and Solander) seems identical.

Teucrium Marum, Linné.

Countries on the Mediterranean Sea. A small, somewhat shrubby plant, in use for the sake of its scent, containing a peculiar stearopten. T. Scordium, from Europe and Middle Asia, T. Chamaedrys, T. Polium and T. Creticum, L., from South-Europe, are occasionally drawn into medical use. All these, together with many other species from various countries, are pleasantly odorous, and frequented by bees.

Thapsia edulis, Bentham. (*Monizia edulis*, Lowe.)

On the Island of Deserte Grande, near Madeira, where it is called the Carrot-tree. It might be of some use, to bring this almost shrubby umbellate to the cliffs of other shores; though the root inferior to a carrot. perhaps cultivation would improve it. decipiens, Bentham (Melanoselinum decipiens, Lowe) from Made is of palm-like habit and desirable for scenic effects in plant-gr ing. T. Silphium (Viviani) is the Silphion of the ancients.

Theligonum Cynocrambe, Linné.

Countries around the Mediterranean Sea, extending to the Canary-Islands. An annual spinach-plant of somewhat aperient effect.

Thouarea sarmentosa, Persoon.

Tropical shores of the eastern hemisphere. This curious and tender grass might be easily introduced, to help in binding the sand on sea-beaches. It likes wet ground.

Thrinax parviflora, Swartz.

South-Florida, West-Indies, also on the continent of Central America. The stem of this Fan-Palm attains a height, according to Dr. Chapman, of about 40 feet, but is extremely slender. Belongs to the sand-tracts of the coast; hardy in the South of France to 43° 32′ N. lat. [Naudin]. The fibre of this palm forms material for ropes. T. argentea (Loddiges) is an allied palm. The few other species of the genus from the West-Indies also deserve trial-culture.

Thuya dolabrata, Linné fil. (*Thuyopsis dolabrata,* Siebold and Zuccarini.)

The "Akeki" of Japan, ascending to an elevation of 8,000 feet. A majestic tree of conical shape and drooping habit, growing to 100 feet high, attaining a stem-diameter of 3 feet. It delights in sheltered and rather moist situations, and is used in China and Japan for avenues. Hardy in Norway to lat. 58° 27′ [Schuebeler]. It furnishes an excellent hard durable timber of a reddish colour, employed particularly for water-works, ship-, bridge- and house-building; the bast-fibre is strong and durable, thus made into ropes [Prof. Luerssen].

Thuya gigantea, Nuttall.

North-Western America. The Yellow Cypress of the colonists, also known as Oregon Red or White Cedar. A straight tree, in some instances known to have attained a height of 325 feet, with a stem 22 feet in diameter; it furnishes a valuable building timber of a pale or light-yellow colour, susceptible of high polish. It is light, soft, smooth and durable, and makes the finest sashes, doors, mouldings and similar articles [Vasey]; also used for shingles [Dawson]. Canoes carrying 4 tons have been obtained out of one stem. The bast can be converted into ropes and mats. The tree may be trained into hedges and bowers. It endures the climate of Christiania. To Thuya are referred by Bentham and J. Hooker all the cypresses of the sections Chamæcyparis and Retinospora.

Thuya Japonica, Maximowicz.

Japan. Closely allied to T. gigantea. Dr. Masters has pointed out the characteristic differences between the two in an essay on Conifers of Japan, published in the Journal of the Linnean Society, 1881.

Thuya occidentalis, Linné.

North-America, extending from Carolina to Canada. Northern White Cedar or Arbor Vitæ. A fine tree, to 70 feet high. Bears the frosts of Norway northward to lat. 63° 52′. The wood is reddish or yellowish, fine-grained, very tough and resinous, light, soft, durable, and well fit for building, especially for water-work and railway-ties, also for turnery and machinery. Michaux mentions, that posts of this wood last forty years; a house built of it was found perfectly sound after sixty years. The tree prefers moist soil; it is valuable for copses; it can also be trained into garden-bowers. Dr. Porcher says, that it makes the finest ornamental hedge or screen in the United States, attaining any required height and being very compact and beautiful; such hedges indeed were observed by the writer himself many years ago in Rio de Janeiro. The shoots and also an essential oil from this tree are used in medicine; the bast can be converted into ropes; the branches serve for brooms.

Thuya orientalis, Linné. (*Biotia orientalis,* Endlicher.)

China and Japan. The Chinese "Arbor-Vitæ" of gardens. Though seldom exceeding 20 feet in height, this common garden-plant is mentioned here, as it will admit of clipping for hedge-growth, and as the "Fi-Moro" variety should on account of its elongated slender and pendent branches be chosen extensively for cemeteries.

Thymelæa tinctoria, Endlicher. (*Passerina tinctoria,* Pourret.)

Portugal, Spain, South-France. A small shrub, which yields a yellow-dye. Cursorily it may be noted here, that some of the Australian Pimeleæ contain a blue pigment, which has not yet been fully tested. Their bark produces more or less of daphnin and of the volatile acrid principle, for which the bark of Daphne Mezereum (Linné) is used; these are remarkably developed in the South-Eastern Australian Pimelea stricta (Meissner). The bark of many is also pervaded by a tough fibre, that of the tall Pimelea clavata (Labillardière), a West-Australian bush, being hence particularly tenacious, and used for whips.

Thymus capitatus, Hoffmannsegg and Link. (*Satureja capitata,* Linn

Around the whole Mediterranean Sea. Since the time of Hip crates, Theophrastos and Galenus this small scented shrub has b employed in medicine. According to Dr. Savastano, an impor honey-plant.

Thymus mastichina, Linné.

Spain, Portugal, Morocco. A half-shrub of agreeable scent, used also occasionally in medicine.

Thymus Serpillum, Linné.

Europe, Western Asia, North-Eastern Africa. A perennial herb of some medicinal value. It would live on the highest alps. An essential oil can be obtained from it. One particular variety is lemon-scented.

Thymus vulgaris, Linné.

The Garden-Thyme. South-Europe, particularly westward. Both this and the preceding species can be grown in Norway up to lat. 70° 22′ [Schuebeler]. This small shrubby plant is available for scent and for condiments; further as a honey-plant. It is also well adapted for forming garden-edges. The essential oil of this plant can be separated into the crystalline thymol, one of the most powerful, best applicable and least dangerous of all antiseptics, and the liquid thymen and cymol. T. æstivus (Reuter) and T. hiemalis (Lange) are closely cognate plants. Several other species with aromatic scent occur at or near the Mediterranean Sea.

Tilia alba, Aiton. (*T. heterophylla,* Ventenat.)

The "Silver-Linden" of the Eastern and Middle States of North-America.

Tilia Americana, Linné.

The Basswood-Tree or North-American Linden-Tree, this fine tree growing there to 52° north latitude in the eastern regions. In Norway it is hardy as far as Christiania (59° 55′) as well as the following [Schuebeler]. It likes deep, friable, somewhat moist soil, on which it is a quick and persistent grower [B. E. Fernow]. Height of tree reaching about 80 feet, diameter of stem 4 feet. The wood is close-grained and firm, as soft as deal; used in the construction of musical instruments, particularly pianofortes. Specially valuable for the cutting-boards of curriers and shoemakers, bowls, pails, shovels, panelling of carriages [Robb]. As the wood is free from knots, it is particularly eligible for turnery and carving and certain portions of machinery. The tree is highly valued for street-planting in its native land, where it also furnishes linden-bast or bass. This is one of the principal honey-plants in many parts of the United States. Quinby saw 25 lbs. of honey gathered by a single swarm in one day from Basswood-flowers, bees travelling gradually several miles for them if necessary. For profusion and quality of honey the flowers are unsurpassed [A. J. Cook]. Rate of stem-growth in Nebraska 35 inches girth at 2 feet from the ground in fourteen years [Furnas]. Wood used also for paper-pulp.

Tilia argentea, Desfontaines.

The Silver-Linden of South-Eastern Europe and Asia-Minor. The wood is not attacked by boring insects. The flowers are deliciously fragrant and yield a precious oil. The oldest specific name, according to Prof. Koch, is T. tomentosa (Moench).

Tilia dasystyla Steven.* (*T. euchlora,* C. Koch.)

Taurus and Caucasus. This tree is placed by F. Diel at the top of the list of deciduous trees for street-planting; very hardy; resists insects and fungs well. The leaves are dark-green, somewhat rigid, and do not collect dust so readily as other linden-trees. Allied to this species is T. rubra, D.C.

Tilia Europæa, Linné.

The common Linden-tree of Europe, extending naturally to Japan; the large-leaved variety (T. platyphylla, Scopoli) of South-European origin, the small-leaved variety being T. cordifolia, Miller. It attains a great age. A very hardy tree, living in Norway as far north as lat. 67° 56′ [Schuebeler]. A weeping variety is known. Height sometimes to 120 feet; stem exceptionally to 50 feet in girth. One of the best of promenade-trees in climes not too dry. Wood pale, soft and close-grained; sought for turnery, piano-keys, carving; used by shoemakers, saddlers and glovers, to cut leather on; also for toys [Simmonds]. The flowers yield a highly aromatic honey. The bast excellent for mats.

Tilia petiolaris, De Candolle.

Bithynia. A lime-tree with pendent branchlets, allied to T. argentea, recently brought under cultural notice by Sir Jos. Hooker.

Tilia Mandschurica, Ruprecht.

Amoor and Mandschuria. Not so tall as T. tomentosa, to which it bears close alliance [Maximowicz, Koch].

Tillandsia usneoides, Linné.

Black Moss, Long Moss, Florida-Moss. From Carolina and Florida to Uruguay and Chili, on trees. Might be naturalized in forests of countries with mild climes. In its native country the almost horsehair-like ramifications a favourite material for upholsterers' work.

Tinguarra Sicula, Parlatore.

Southern Italy. The root is edible and celery-like.

Todea Africana, Willdenow. (*Osmunda barbara,* Thunberg.)

South-Africa, South-Eastern Australia, New Zealand. The colossal "square fern," most important for scenic effects in wet places; as an export article the very aged stems of this fern

now much sought, and have endured wide transits, which were initiated by the writer. Stems have been found bearing from 500 to 600 fronds. A gigantic specimen was got in the Dandenong-forests, the trunk of which weighed 4,568 lbs., after many fronds were cut away, the extreme dimensions of the stem being about 6 feet in height, breadth and width. Supplies of this massive fern in the gullies ought to be maintained for future generations by the artificial dispersion of the dust-like spores.

Torreya Californica, Torrey. (*T. myristica,* Hooker).

California, extending from the coast to the Sierras. A symmetrical tree, becoming about 100 feet high, with a clear straight trunk to 30 feet in length and 6 feet in diameter [Dr. Gibbons]. The wood is hard and firm.

Torreya grandis, Fortune.

The "Kaya" of China. A tree at length 60 feet high, with an umbrella-shaped crown; it produces good timber. Dislikes exposure to intense heat and light.

Torreya nucifera, Siebold. (*Caryotaxus nucifera, Zuccarini.*)

Japan. Height of tree about 30 feet. From its nuts the Japanese press an oil, used as an article of food. The wood is highly valued in Japan by coopers, also by turners; it resembles to some extent boxwood [Dupont].

Torreya taxifolia, Arnott.

Florida. A tree, reaching about 50 feet in height. Wood firm, close-grained, light, durable, of a reddish colour; very lasting also underground. Prostrated trees did not decay in half a century. Timber slightly more yellow than that of the white pine [P. J. White]. The tree yields a reddish turpentine [Hoopes].

Touchardia latifolia, Gaudichaud.

In the Hawaian Islands. A shrub, allied to Boehmeria nivea, yielding a tough and easily separable fibre, as shown by Dr. Hillebrand. Probably best adapted to humid warm gullies.

Tragopogon porrifolius, Linné.

The "Salsify." Middle and Southern Europe, Northern Africa, South-Western Asia; hardy to lat 70° in Norway. Biennial. The root of this herb is well known as a useful culinary vegetable; it is obtainable even in cold countries through the winter; the young leaves supply a very good salad [Vilmorin]. Pasture-animals are very fond of this easily raised and quickly growing plant, as

affording a sweetish food. In Afghanistan and countries near thereto T. coloratus (C. A. Meyer) is used as Salsify [Dr. J. Aitchison].

Trachylobium Hornemannianum, Hayne.

Eastern tropical Africa. A large tree, content with sandy soil. Thrives as far south as Natal [J. M. Wood]. Affords largely the East-African Copal. T. verrucosum (Oliver) from Madagascar is closely allied and serves the same purpose.

Trapa bicornis, Linné fil.*

The Leng, Ling or Links of China. The nuts of this water-plant are extensively brought to market in that country. The horny appendages of the fruit are blunt. The kernel, like that of the two following species or varieties, is of an excellent taste. The plant is regularly cultivated in the lakes and ponds of China.

Trapa bispinosa, Roxburgh.*

Middle and Southern Asia, where it is called "Singhara," extending to Ceylon and Japan; found also in Africa as far south as the Zambesi. The nuts are often worked for starch. They can be converted into most palatable cakes or porridge, and may be stored for food, even for several years; their taste is pleasant. The produce is copious and quite maintained by spontaneous dissemination. In some countries, for instance in Cashmere, the nuts in a raw or cooked state form an important staple of food to the population. To this species probably belong T. Cochin-Chinensis (Loureiro) and T. incisa (Siebold and Zuccarini).

Trapa natans, Linné.*

The ordinary Waternut. Middle and Southern Europe, Middle Asia, Northern and Central Africa. Recorded as an annual. T. quadrispinosa (Roxburgh) from Sylhet, is a mere variety. Water-fowl must be kept from places, where the Trapa is to prosper. Fruits do not keep longer than one season, and must be preserved in water Vilmorin]. Mr. Hemsley has reduced all the Trapas to one species, the intenability of the Eastern congeners having been suspected before. Reproduction both by seeds and offshoots.

Tremella mesenterica, Retzius.

From Europe to Australia. Arrayed by Dr. L. Planchon with the fungs fit for human food.

Trichodesma Zeylanicum, Brown. (*Pollichia Zeylanica,* F. v. M,)

From Abyssinia and Southern Asia to extra-tropical Australia. An annual herb, perhaps available for green manure. Dromedaries show an extraordinary predilection for the herb [Giles]. Seven other species deserve trial for fodder-growth.

Trichostema lanatum, Bentham.

California, where it is called the "Black Sage." A half-shrub, recorded by Mr. A. J. Cook in the "Bee-keepers' Guide" among important honey-plants.

Trifolium agrarium, Dodoens. (*T. aureum,* Pollich.)

The Perennial Yellow Clover or Hop-Clover. All Europe, Northern Africa, Western Asia; wild in Norway northward to lat. 63° 26′ [Schuebeler]. Of considerable value in sandy soil as a fodder-herb. It is easily naturalised.

Trifolium Alexandrinum, Linné.*

The Bersin-Clover. North-Eastern Africa, South-Western Asia, South-Europe. Much grown for forage in Egypt, where it is used as the main-fodder. On the Nile it gives three green crops during the season, each up to 2 feet high. Seeds of this and other clovers must be sifted, to free them from any of the destructive Dodder-plants or Cuscutas. About 20 lbs. of seed are required for an acre [Morton]. Recorded as annual.

Trifolium alpestre, Linné.

Europe. Western Asia. Perennial. Content with lighter soil than that needed for most clovers, but the constituents must be fairly marly or limy. This clover is early out and very palatable to herds and flocks [Langethal].

Trifolium fragiferum, Vaillant.*

The Strawberry-Clover. Europe, North-Africa, Middle and Northern-Asia. Indigenous in Norway to lat. 59° 55′. A perennial species, well adapted for clay-soils. Foliage closer and more tender than that of the white clover, but its vegetation later [Langethal]. Morton recommends it for moist sandy soil. It delights in ground much wetter than suits most other clovers; it spreads over humid pastures most readily, with a growth more luxuriant than that of white clover, consequently stands the summer-heat better, smothering most other plants and covering the ground with a thick and close herbage. Cattle are very fond of it, and fatten well on it [Geo. Black].

Trifolium furcatum, Lindley.

California. A stout and somewhat succulent species, with large flower-heads, Affords good pasturage [A. Gray], and gets disseminated readily; but it is annual. Several other native clovers occur in Western North-America; 25 are described from California.

Trifolium glomeratum, Linné.

Countries at or near the Mediterranean Sea, extending indigenously to South-England. Will live even on sandy pastures, spreads readily by dissemination on its own accord, helps to supplant weeds, but fails in our autumn, when pasture-herbs are most wanted.

Trifolium hybridum, Linné.*

The Alsike-Clover. Europe, Northern Africa, Western Asia. Wild in Norway to lat. 63° 50′. A valuable perennial pasture-herb, particularly for swampy localities. It succeeds, where the ground becomes too sandy for lucerne and too wet for red clover, but does not withstand drought so well, while it produces a heavier bulk of forage than white clover, and maintains its ground, when the soil has become too much exhausted for other clovers. The best kind for irrigation; as nutritious as white clover, suitable for pasturage as well as for mowing. The seed being very small, less than half the quantity is required for the same area as of red clover. Much frequented by bees for honey.

Trifolium incarnatum, Linné.*

The Carnation-Clover, also called Crimson or Italian Clover. Southern Europe, extending naturally to Switzerland. In Norway it can be grown to lat. 70° 22′. Though annual only or sometimes biennial, it is valued in some of the systems of rotations of crops. In the south of England it is much sown on harrowed stubble-fields, to obtain an early feed of great fattening value. It forms particularly a good fodder for sheep, and is recommended especially for gypsum-regions. A white-flowering variety exists. Bees are very fond of this clover [Darwin].

Trifolium medium, Linné.

The Red Zigzag-Clover. Europe, Northern and Middle Asia. Indigenous in Norway to lat. 63° 26′ [Schuebeler]. A deep-rooting wide-creeping perennial herb, much better adapted for dry sandy places than T. pratense. It would also endure the inclemency of the clime of alpine heights, if disseminated there; also one of the best of clovers for forest-regions. For regular culture it needs lime, like most plants of its class. More hardy than T. hybridum, less productive than T. pratense [Langethal]. It ought not to be omitted among mixed clovers and grasses. According to Morton it is not so much sought and relished by grazing animals as many other clovers. T. Quartinianum (A. Richard) is an allied plant from Abyssinia, where several endemic species exist.

Trifolium montanum, Linné.

Europe, Western Asia. Perennial. Not without importance f limy or marly ground. It is indigenous northward to Christia

Trifolium ochroleucon, Hudson.

Pale-yellow Clover. Middle and Southern Europe, Western Asia. Perennial. This species is much cultivated in Upper Italy; its value is that of T. medium [Langethal].

Trifolium Pannonicum, Linné.

The Hungarian Clover. Southern Europe. Perennial. Earlier in the season than red clover, to which it is allied, but less tender in foliage [Morton].

Trifolium pratense, Camerarius.*

The ordinary Red Clover. All Europe, North-Africa, Northern and Middle Asia. It is found wild as far north as 69° 20′ in Norway [Schuebeler], and endures an Alpine clime. A biennial, or under certain circumstances also a perennial herb, of special importance for stable-fodder. The perennial variety passes under the name of Cow-clover, by which name also T. medium is sometimes designated. Highly recommendable for permanent pastures, particularly in cool humid climes. as it continues to grow year after year, and produces a large amount of herbage [Dr. Curl]. It prefers rich ground and particularly soil, which is not devoid of potash and lime; gypsum-dressings are recommendable for the fields. Perishes in stagnant moisture. It enters into the rotation-system of crops very advantageously. The annual average yield of hay is 40 cwt. from an acre by cutting twice, but sometimes twice as much is obtained. The nectar of the flowers is much sucked by bumble-bees; this tends to facilitate the production of seeds. Clovers and Lucerne are subject to be attacked by some kinds of parasitic plants, namely, species of Cuscuta and Orobanche, from which fields must he held free by using well sifted seeds only, or by ploughing in before the parasites come into fruit. If badly infested, land be kept fallow for awhile and be periodically stirred; any Dodder-seeds, left in the soil, will germinate when brought to the surface, but their seedlings will die off in the absence of the foster-plant.

Trifolium reflexum, Linné.

The Pennsylvanian or Buffalo-Cover. Eastern North-America. Annual or biennial; flower-heads larger than those of the red clover; likes alluvial flats.

Trifolium repens, Rivin.*

The ordinary White Clover, called also Dutch Clover and Shamrock-Clover. Europe, North-Africa, Northern and Middle Asia, sub-artic America, ascending the European Alps to 8,000 feet. In Norway indigenous to lat. 70° 57′. Perennial. Most valuable as a fodder-plant on grazing land. It has a predilection for moist, soil, but also springs again from dry spots after rain. It likes soil containing potash and lime, prospers on poorer ground than red

clover, is more nourishing and better digested, and less exhaustive to the soil. Dressing with gypsum vastly enhances the value and productiveness of any clover-field. Fresh wood-ashes are for the same purpose recommendable [Dr. Stebler]. Important as a bee-plant.

Trifolium resupinatum, Linné.

The annual Strawberry-Clover. From South-Europe and North-Africa to Persia; also in the Canary-Islands and Azores. Admitted here, though annual, as this clover is cultivated with predilection in Upper India, also in Afghanistan; it is quite a useful pasture-plant, though small, closely cropped by herds and flocks, and then continuous in growth; easily naturalised. Headlets of flowers conspicuously produced. Mr. Stuart Reid observes, that it will live through drought and floods.

Trifolium spadiceum, Linné.

Brown Clover. Europe, Western Asia. Perennial. This has been recommended for wet sandy moorland, on which it gets disseminated with readiness.

Trifolium subrotundum, Hochstetter.

The Mayad-Clover. Northern and Middle Africa, ascending to 9,000 feet. A perennial species, in its native countries utilised with advantage for clover-culture.

This by no means closes the list of the clovers variously desirable for introduction, inasmuch as about 150 well-marked species are recognized, many doubtless of value for pasture. But the notes of rural observers on any of these kinds are so sparingly extant, that much uncertainty about the yield and nutritive value of various kinds continues to prevail. Most clovers come from the temperate zone of Europe and Asia: only two are indigenous to the Eastern of the United States of North-America, none occur in Australia, few are found in South-Africa, a good number in California and the adjoining countries, several also in Chili, no species is peculiar to Japan.

Triglochin procera, R. Brown.

Widely distributed through Australia. This remarkably large perennial is worthy of dissemination in and around swamps, as cattle feed on it with avidity; it produces small edible tubers.

Trigonella Fœnum Græcum, Linné.

Countries on the Mediterranean Sea, Western and Central Asia. The seeds of this annual herb find their use in veterinary medic The foliage used in some oriental countries as a culinary veget

Trigonella suavissima, Lindley.

Interior of Australia from the Murray-River and its tributaries to the vicinity of Shark-Bay. This perennial, fragrant, clover-like plant proved a good pasture-herb. It was used as a spinage during Sir Thomas Mitchell's expedition. A lithogram, illustrating this plant, occurs in the work on the "Plants indigenous to Victoria." Some of the many European, Asiatic and African species of this genus deserve local pastoral tests.

Trillium erectum, Linné.

"The Birthroot." Eastern North-America. This liliaceous plant has found its way into the materia medica.

Triodia exigua, Th. Kirk.

South-Island of New Zealand, at 1,200 to 3,000 feet elevation, Forms naturally almost even plots, often many square-yards in extent; the leaves are hard, short and shining; the compact growth of the turf or sward prevents weeds and other grasses to encroach. It is particularly to be recommended for croquet-lawns, never requiring mowing [Prof. Th. Kirk]. Should prove especially valuable in colder countries for lawns, and may hold its ground also in hotter climes through some irrigation. Likely of use also for edgings in gardens.

Triphasia Aurantiola, Loureiro.

South-Eastern Asia. This shrub is worth cultivation for the exquisite fragrance of its flowers. The fruits, though small, are of pleasant sweetness; they should prove good for preserves. The plant may also prove well adapted for hedges. Glycosmis citrifolia (Lindley) and Claussena punctata (Oliver), also East-Asiatic fruit-shrubs, may possibly show themselves hardy in sheltered forest-regions of warm temperate climes.

Tripsacum dactyloides, Linné.

Central and Northern America; known popularly as a Gama-grass. A reedy perennial grass, more ornamental than utilitarian. It is the original Buffalo-grass, and attains a height of seven feet, assuming the aspect of maize. It seems of inferior value for feed, but serves for binding sand. Prof. C. Mohr however regards it as a valuable fodder-grass. The seeds are available for food. Howard, speaking in Carolina of this grass, contends, that it may be cut three or four times in a season, that it makes a coarse but nutritious hay, and that the quantity of forage, which can be made from it, is enormous; cattle and horses are fond of it, and the hay can be harvested easily.

Trisetum antarcticum, Trinius.

New Zealand. Ascending to sub-alpine elevations. A perennial lustrous grass, particularly fit for cool climes. According to Mr. John Buchanan it keeps its ground well, becoming an important element locally in the pasture-vegetation. The abundant natal growth indicates, how easily this grass by dissemination could be naturalised elsewhere.

Tristania conferta, R. Brown.

New South Wales and Queensland. A noble shady tree, attaining a height of 180 feet [A. R. Crawford]. It is not only eligible as an avenue-tree, but also as producing select timber; ribs of vessels from this tree have lasted unimpaired thirty years and more. Growth in height 20-30 feet at Port Phillip in twenty years.

Trithrinax Acanthocoma, Drude.

Rio Grande do Sul, in dry elevations. A dwarf Fan-Palm for window- or table-decoration, attaining only a height of about 6 feet; foliage not leathery. As regards the use of many kinds of palms the important work "Les Palmiers" by Count O. Kerchove de Denterghem (1878) should be consulted.

Trithrinax Brasiliensis, Martius.

Rio Grande do Sul, Parama, Uruguay and Paraguay. A very hardy palm, not tall. It is probably one of the species of this genus, to which Mr. C. Napier Bell refers as very locally indigenous on the plains of Southern Brazil and Northern Paraguay, where it is called the "Botea." He mentions, that itis only about a dozen feet high, and that the inhabitants of the provinces Sao Pedro and Sao Francisco make purposely journeys at the right season, to obtain the berries, which have a taste between that of the Pine-apple and Raspberry.

Trithrinax campestris, Drude.*

Argentina, as far south as 32° 41'. Height reaching about 30 feet. One of the most southern of all palms. Content with even less humidity than Chamærops humilis. The leaves are almost of a woody hardness and stiffer than those of any other palm [Drude]. Germination of seeds easy [Lorentz and Hieronymus]. Another species occurs in Southern Bolivia.

Triticum junceum, Linné. (*Agropyron junceum,* Beauvois.)

Europe and North-Africa. A rigid coast-grass, with pungen leaves and extensively creeping roots, requiring sea-sand for it permanent growth. One of the best grasses, to keep rolling sa ridges together, and particularly eligible, where cattle and ot domestic animals cannot readily be prevented from getting ac

Triticum vulgare, Villars.*

The Wheat. Indigenous to the Euphrates-regions, according to A. de Candolle. Traced back more than 5,000 years as an Egyptian and Chinese culture-plant; indeed the earliest lacustrine people in Switzerland reared wheat in the stone-age [Heer]. Excellent wheat was grown in Britain prior to the Christian era [Carruthers]. Among the utilitarian plants of the world Wheat takes the very first position through the widest area. In many intra-tropical countries, not too wet, wheat and barley can be grown as winter-crop. At Irkutzk some varieties of wheat ripen still during the short but warm summer, though the soil three feet below the surface remains permanently frozen [Dr. Z. Oppenheimer]. The hon. J. L. Dow introduced into Australia a Mexican variety of Wheat, which matures six weeks earlier than the ordinary sorts. In Japan some kind of wheat is of extraordinary precocity [Lartigne], and it is greatly recommended there as a forage-plant. The Punjab-Wheat with a few other varieties is usually rust-proof. The kinds of Rust-fungs, attacking Wheat, are Puccinia graminis (Persoon), P. clandestina (Desmazières) or P. straminis (Fuckel) and P. coronata (Persoon). This is not the place, to enter into details about a plant universally known, unless we may allude to the much overlooked fact, that a light beer can be brewed from wheat; it may therefore suffice merely to mention, that three primary varieties must be distinguished among the very numerous sorts of cultivated wheat: 1. *Var.* muticum (T. hybernum, L.), the Winter-Wheat or Unbearded Wheat; 2. *Var.* aristatum (T. æstivum, L.), the Summer-Wheat or Bearded Wheat; 3. *Var.* adhærens (T. Spelta, L.), Wheat with fragile axis and adherent grain. Metzger enumerates systematically as distinct kinds of cultivated wheat:—

T. vulgare, Villars, which includes among other varieties the ordinary Spring-Wheat, the Fox-Wheat and the Kentish Wheat. It comprises also the best Italian sorts for plaiting straw-bonnets and straw-hats, for which only the upper part of the stem is used, collected before the ripening of the grain, and bleached through exposure to the sun while kept moistened.

T. turgidum, Linné, comprising some varieties of White and Red Wheat, also the Clock-Wheat, the Revet-Wheat and the Poulard-Wheat. The straw of the "Poulard" variety is unusually solid.

T. durum, Desfontaines, which contains some sorts of the Bearded Wheat.

T. Polonicum, Linné, the Polish Wheat, some kinds of which are well adapted for peeled Wheat.

T. Spelta, Linné, the Spelt-Corn or Dinkel-Wheat, a kind not readily subject to disease, succeeding on soil of very limited fertility, not easily attacked by birds, furnishing a flour of

excellence for cakes, also yielding a superior grain for peeled wheat. For preparing the latter it is necessary to collect the spikes while yet somewhat green, and to dry them by artificial heat.

T. dicoccum, Schrank, (*T. amyleum*, Seringe). The Emmer-Wheat. Cultivated in Ancient Egypt already [Prof. Koernicke]. Its varieties are content with and prolific on poor soil, produce excellent starch, are most hardy and not subject to diseases. To this belongs the Arras-Wheat of Abyssinia, where a few other peculiar sorts of wheat are to be found. A large-grained variety of wheat is baked in Persia [Colvill].

T. monococcum, Linné. St. Peter's Corn, which is hardier than most other wheats; exists in the poorest soils, but produces grains less adapted for flour than for peeled wheat. Indigenous to Servia, Greece and Turkey, if derived from T. Bœoticum (Boissier). The Champlain-Wheat, recently here introduced by me, yields about 40 fold and seems quite rust- and smut-proof; the crop is heavy; but this variety is preferable for green fodder and hay, the grain carrying too much bran [Hermiston]. Dr. Bancroft's experiments in Southern Queensland showed the common Indian Bearded Wheat to be exempt from rust, as well as two beardless varieties from the same part of Asia. On this subject see also the print of my lecture before the Agricultural Society of Bendigo, "on rust in wheat," 1865. According to the report of the Commissioner of Agriculture 37 millions of acres were in 1882, under wheat-culture in the United States. Wheat can be brought by proper choice of the season even to mature in Central Australia [Rev. H. Kempe]. Latterly advanced in Upper India to a culture over about 20 million acres. In various parts of the world the prodigious quantity of 60 bushels on an acre is sometimes obtained on rich and new land. Mr. E. T. Wickson, of the University of California, mentions the following varieties, out of about 100, as proof against the larva and pupa of the Hessian fly (Cecidomyia destructor):—Bearded wheat of Missojen, Palestine, Petali, Volo, Greek Wheat from Atlanti, Forelle; they all belong to the type, T. durum, and are remarkable for their rigid solid stems and for their hard grains, rich in gluten, and all requiring a warm clime. Change of seed-grains, even of the same variety, from the most favorable localities, is always desirable.

Among the conditions for rendering Wheat-crops safe against rust-fungs are prominent: thorough drainage of the field, sufficiency of potash, lime and phosphoric acid in the soil, choice of varieties of least sappy constitution and of early maturation, yearly rene of seed-grain of rust-resisting varieties from their original l tions; early sowing, and this not too close, suppression of all k of grasses and weeds on the field and in its vicinity, sel of whatever manures applied entirely free of rust, imm

cutting of any affected position of the crop, supervision strictly exercised by public officials; these measures to be connectedly enjoined. Soil, so strongly pervaded by chloride of sodium as barely to be yet capable of producing ordinary grasses, seems also to give wheat free of rust. Dr. Plowright recommends against smut immersions of the seed-grain in water heated to 132° F.

Tropæolum majus, Linné.

Peru. This showy perennial climber passes with impropriety under the name of Nasturtium. The herbage and flowers serve as cress, and are also considered antiscorbutic. The plant can be grown in Norway northward to lat. 70° 22′ [Schuebeler]. Has some insecticidal value, and it is even said, that when planted around apple trees, it will rid them finally of the woolly Aphis. A smaller species, T. minus, L., from Peru, can likewise be chosen for a cress-salad; both besides furnish in their flower-buds and young fruits a substitute for capers. A volatile oil of burning taste can be distilled from the foliage of both, and this is more acrid even than the distilled oil of mustard-seeds. In colder countries these plants are only of one year's duration. Numerous other species. all highly ornamental, occur in South-America and some few also in Mexico. The seeds will keep for several years.

Tropæolum sessilifolium, Pœppig.

Chili. Among the species of this genus one of the most eligible for its tubers, which can be consumed even in a raw state, and are larger than those of most other Tropæolums, while the stems are short and procumbent [Prof. Philippi].

Tropæolum tuberosum, Ruiz and Pavon.

Peru and Bolivia, up to the higher mountain-regions. The tuberous root serves as an esculent; some frost improves it.

Trophis Americana, Linné.

West-Indian Archipelagus. The foliage of this milky tree has been recommended as food for the silk-insect. In Cuba and Jamaica it is used as provender for cattle and sheep.

Tuber æstivum, Micheli.

Middle and Southern Europe. The truffle most frequent in the markets of England. The White British Truffle, Chairomyces meandriformis, though large, is valued less. In the Department Vaucluse alone about 60,000 lbs. of truffles are collected annually, at a value of about £4,000. Many other kinds of truffles are in use. The Australian truffle, Mylitta Australis (Berkeley) or Notiohydnum Australe, sometimes attains the size of the cocoa-nut, and is also a fair esculent. It seems quite feasible, to naturalise the best edible fungs of these and other genera, although such may not

be amenable to regular culture; thus efforts should be made for the introduction of all the superior kinds of truffles, as an insight into the manner, in which vegetables of the fungus-species might be transferred to wide distances, has gradually been obtained. The total value of the export of truffles from France in 1877 amounted to considerably over half a million pounds sterling, the total production in that year being valued at about £800,000. The annual revenue of the truffle-ground of Carpentras is, according to Simmonds, £80,000. The great White North-American Truffle (Tuber album) is as white as snow and as tender as curds [Millington].

Tuber albidum, Caesalpini.

Occurs with T. æstivum, but is smaller and less agreeable in taste.

Tuber cibarium, Sibthorp.

The Black Truffle. Middle and Southern Europe. Like all others growing underground, and generally found in forest-soil of limestone-formation. It attains a weight of over one pound. Experiments for naturalisation may be effected with every prospect of success by conveying any truffle in its native soil and locating it in calcareous places of forest-regions. As a condiment or merely in a roasted state, it affords an aromatic food. The famous Quercy- or Perigord-Truffle is derived from this species. T. melanosporum (Vittadini) from France, Germany and Italy, is of a still more exquisite taste than T. cibarium—indeed, of strawberry-flavor.

Tuber magnatum, Pico.

Grey Truffle. South-Europe. One of the most esteemed of all truffles, with some garlic-flavor. Hymenogaster Bulliardi (Vittadini) and Melanogaster variegatus (Tulasne) of South-Europe are also excellent truffles.

Tuber rufum, Pico.

Southern Europe, extending to Britian. Red Truffle, especially in vineyards. Much used for food, but smaller than Terfezia-Truffles.

Tulipa Gessneriana, Linné.

Caucasus and adjoining regions. The alkaloid of this popular garden-plant is a very powerful Sialogogue [Prof. Ringer].

Typha latifolia, Linné.

The Cattail, large Reedmace or Bulrush. Widely distributed over the northern hemisphere—in Norway to lat. 60° 41′. Worthy of being encouraged in its growth on rivers and around lakes, or of being transferred to unutilised waters, as the very light and soft foliage can be converted into material for mattresses, which in

Royal Navy of Italy have come into universal use as additional means of saving human life in the event of shipwreck. These mattresses continue to float for a very long time and bear a great weight; thus one mattress is capable of supporting several persons in water (Marquis Toverena and Admiral Romano). The large rootstocks are rich in nourishing starch. The closely allied T. angustifolia extends to Australia.

Ulex Europæus, Linné.

The Whin, Gorse or Furze. Western and Southern Europe, Azores, Canary-Islands; hardy in Norway to lat. 58° 58′. A bush important for covering quickly drift-sands on coasts, not readily approached by pastoral animals. Too apt to stray as a hedge-plant. The straightened stems even used for umbrellas, parasols and walking-sticks [J. R. Jackson]. Prof. C. Koch recommends a thornless variety for sheep-pastures.

Ullucus tuberosus, Lozano. (*Melloca tuberosa,* Lindley.)

Andes of New Granada and Peru, up to an elevation of 9,000 feet. A perennial herb, the tubers of which are edible; they are of about the size of hens' eggs. Can be propagated from cuttings, and will endure some frost [Watson]. A mean temperature of about 50° F. is favorable for the production of tubers of this plant [Vilmorin]. Shablee found the tubers in a dried state to contain 3 per cent. fat, 4 per cent. gum, 19 per cent. grape-sugar, 33 per cent. starch, 12 per cent. albumen.

Ulmus alata, Michaux.

The Whahoo-Elm of North-America, extending to Newfoundland and Texas. Of quick growth. Height of tree reaching about 40 feet. Wood fine-grained, heavier and stronger than that of the White Elm, of a dull-red colour, unwedgeable, used by wheelwrights, but like that of U. Americana not equal to the wood of the European Elm.

Ulmus Americana, Linné.*

The White Elm of Eastern North-America, also called Rock- or Swamp-Elm. A tree of longevity, fond of moist river-banks, becoming fully a hundred feet high; trunk to 60 feet and as much as 5 feet in diameter. The tree is found hardy in Norway fully to lat. 59° 55′. Manning mentions, that trees have been known to attain a circumference of 27 feet at 3 feet from the ground, and of 13 feet where the branches burst forth. It is highly prized for street-planting in North-America. Can be propagated from suckers like the European elm, irrespective of multiplication from cuttings or seeds. Almost indifferent to soil. The timber is light, used for wheelwrights' work, for tubes, water-pipes; bears driving bolts well [Robb]; it is durable, if either kept quite dry or permanently

submerged in water. U. Floridana (Chapman) is a variety. Rate of growth in Nebraska: stem-circumference, 53 inches in 24 years 2 feet above ground [Furnas].

Ulmus campestris. Linné.*

The ordinary Elm, indigenous to Europe and temperate Asia, as far east as Japan. Several marked varieties, such as the Cork-Elm and Wych-Elm, exist, also a weeping variety. The elm in attaining an age of several centuries, becomes finally of enormous size. Sir Joseph Hooker records the height of a tree at 125 feet, with a stem-circumference of 50 feet. Grew at St. Vincent's Gulf in 30 years to a height of about 66 feet [R. B. Smith]. In Britain it has been occasionally attacked by Scolytus destructor, and irrespective of this beetle, also by the Goat-moth, Cossus ligniperda, both boring into the stem. Latreille already recommended, to catch the larvæ of these borers by surrounding the stem-base with a mixture of clay and cow-dung. A coating of coal-tar to the affected portions of the stem has lately been recommended. The wood is tough, hard, fine-grained and remarkably durable, if constantly under water. Next to yew it is the best of European woods, where great elasticity is required, as for archery-bows. It is also used for keels, blocks, wheels, piles, pumps, gun- and railway-carriages, gunwales, mill-work, various tools and implements. Elm-piles of the old London-Bridge were found to be in a soundcondition after being in the ground for 800 years. The Wych-Elm (U. montana, Withering) grows still further north than the Cork-Elm (U.suberosa, Moench), in Norway to lat. 66° 59′; even in lat. 59° 45′ Professor Schuebeler found a tree still over 100 feet high, with a stem 4 feet in diameter. The wood of the Wych-Elm is preferred for bending purposes [Eassie]. The bast is tough. The average growth at Port Phillip proved 40 feet in 25 years, but in very favorable situations considerably more. Here almost as long without leaves as in colder climes. De Candolle estimated a particular aged elm in France to be 335 years old.

Ulmus crassifolia, Nuttall.

The Evergreen Elm of Mexico, Arkansas and Texas. A tree fully 90 feet high and 2 feet in stem-diameter.

Ulmus fulva, Michaux.

The Slippery or Red Elm of Eastern North-America. Reaching a height of about 60 feet. Splendid for street-planting. There is a pendent-branched variety. Wood red, tenacious, useful for wagon-hubs and wheels [Vasey]. Regarded as the best North-American wood for blocks of rigging, according to Simmonds. The leaves seem available as food for the larvæ of the silkmoth; the bark is employed in medicine. Rate of growth, little more than half that of the White Elm [Furnas].

Ulmus Mexicana, Planchon.

Cordilleras of South-Western North-America. This elm attains a height of 60 feet or perhaps more. Many of these elms are available as quick-growing avenue-trees for shade-lines.

Ulmus parvifolia, Jacquin.

The Evergreen Elm of China, Japan, Upper India and Burmah. A similar tree is found on the Himalayan mountains. Well eligible for big hedges.

Ulmus pedunculata. Fougeraux. (*U. ciliata,* Ehrhart.)

Europe and Asia, through the middle zone. A fine avenue-tree.

Ulmus racemosa, Thomas.*

The Cork-Elm of North-America, also called Western Rock-Elm. Wood as valuable as that of U. Americana, but much heavier; it is fine-grained and compact, tough, flexible, not liable to split, holds bolts better than most timber, and is extremely durable when constantly wet; deserves unqualified praise as a furniture-wood for hardness, strength, beauty and buff-reddish tint; also largely employed for piles, pumps, naves, tackle-blocks, keels, gunwales, heavy agricultural implements, such as mowing and threshing machines, ploughs [Robb, Sargent].

Ulmus Wallichiana, Planchon.

Himalayan Elm. In the mountains of India from 3,500 feet to 10,000 feet. A tree, sometimes to 90 feet high, the stem attaining a girth of 24 feet, but of rather slow growth [Gamble]. Bark very tough; foliage locally lopped off for cattle-fodder [Brandis]. U. lancifolia (Roxburgh) occurs in the same region as a large tree, yielding, according to Gamble, reddish hard wood.

Umbellularia Californica, Nuttall. (*Oreodaphne Californica,* Nees; *Tetranthera Californica,* Hooker and Arnott.)

Oregon and California, where it is called the "Mountain-Laurel" or "Bay-tree." Finally to 100 feet high; throughout pervaded by a somewhat camphoric odor. Wood most valuable for cabinet-work, also for the best of flooring; that of the root splendid for turnery; it is hard, close-grained, durable, easily worked, susceptible of high polish [Dr. Behr and Prof. Bolander].

Uniola gracilis, Michaux.

North-America. A perennial pasture-grass of considerable value, content with sandy soil, and liking the vicinity of the sea. Root creeping.

Uniola latifolia, Michaux.

North-America. This rather tall perennial grass forms large tufts, and affords valuable fodder; it is best adapted for shady woodlands [C. Mohr].

Uniola paniculata, Linné.

North-Eastern America. This tall maritime grass can be chosen on account of its creeping roots, to bind rolling coast-sands.

Urena lobata, Linné.

Intra-tropic girdle around the globe. This perennial herb has recently been enumerated among plants with comparatively tenacious fibre; it can be reared far beyond the tropics. Some congeneric plants can similarly be utilized. Probably objectionable near sheep-runs on account of the minute prickles of its fruits.

Urginea Scilla, Steinheil. (*Scilla maritima,* Linné.)

The medicinal Squill. Countries around the Mediterranean Sea, Canary-Islands. Already ordered by Charles the Great to be grown in the imperial gardens. This coast-plant needs no regular cultivation; but settlers living near the sea might encourage its dissemination, and thus obtain the bulbs as drugs from natural localities. Its peculiar bitter principle is called scillitin. The bulb contains 24 per cent. tannin. U. altissima (Baker) serves in South-Africa as squill.

Uvularia sessilifolia, Linné.

North-America, in forests. This pretty herb is mentioned as yielding a good substitute for asparagus.

Vaccinium alatum, Dombey. (*Thibaudia alata,* Dunal.)

Frigid regions of the Andes of Peru. A tall evergreen shrub, with pink berries of the size of a cherry. This highly ornamental plant could be grown in sub-alpine regions for its fruits.

Vaccinium Arctostaphylos, Linné.

From Greece to the Caucasus. The leaves, dried and slightly heated, furnish the Broussa-tea, the material for a fairly palatable beverage [G. Maw], possibly of medicinal value. Dr. G. Dieck praises the berries as very relishable.

Vaccinium bicolor, F. v. Mueller. (*Thibaudia bicolor,* Ruiz and Pavon.)

Cold zones of the Peruvian Andes. A high evergreen bush, with red berries of about the size of a hazel-nut. All Thibaudias seem best to form a section in the genus Vaccinium, some species of the latter—for instance, Vaccinium Imrayi (Hooker) from Dominica mediating the transit. The species of the section Thibaudia, as a rule, produce red berries of acidulous grateful taste. Many c

may therefore deserve culture or naturalisation in forest-ravines or on sub-alpine heights. They occur from Peru to Mexico, also in the West-Indies. One species, Vaccinium melliflorum (Thibaudia melliflora, Ruiz and Pavon), has its flowers particularly rich in honey-nectar.

Vaccinium caespitosum, Michaux.

Labrador, Canada and North-Eastern States of the American Union. A deciduous-leaved small bush, with bluish edible berries. V. ovalifolium (Smith) is an allied species.

Vaccinium Canadense, Kalm.*

From the Middle States of North-America northwards. A dwarf shrub in swampy ground of woodlands. Yields, like V. Pennsylvanicum, to which it is allied, edible blueberries or huckleberries. Mr. Marity calls the berries delicious, fetching a high price—up to 11 dollars a bushel, never lower than 5 dollars, in New York. One bush yields from a pint to a quart of berries. It thrives through all grades of soil and exposure. The berries are rather large and aromatic; for cooking and preserves they locally take precedence to any other kind of berry; they are easily dried, and retain their full delicious flavor. The bush grows occasionally to a height of 15 feet.

Vaccinium corymbosum, Linné.

The Swamp-Blueberry or Blue-Huckleberry. Canada, Eastern and Western States of North-America. A good-sized shrub, reaching a height of 15 feet, with deciduous foliage. Berries bluish-black, rather large, aromatic, of sweetish taste, ripening late in the season. The frequency of this bush in its native countries induces the anticipation, that it could readily be disseminated elsewhere in apt climes and soils.

Vaccinium erythrocarpum, Michaux. (*Oxycoccus erectus,* Pursh.)

Carolina and Virginia, on high mountains. An upright bush, a few feet in height, with deciduous leaves. The transparent scarlet berries, according to Pursh, are of excellent taste. V. Japonicum (Miquel) is a closely allied East-Asiatic representative.

Vaccinium grandiflorum, Dombey. (*Ceratostemma grandiflorum,* Ruiz and Pavon.)

Andes of Peru. A tall evergreen shrub. The berries of a pleasant acidulous taste.

Vaccinium humifusum, Graham.

North-Western America, particularly on the Rocky Mountains. Berries of this bush well-flavored.

Vaccinium Leschenaultii, Wight. (*Agapetes arborea,* Dunal.)

Southern India, extending to Ceylon, at elevations from 4,000 to 8,000 feet. This evergreen species attains the size of a small tree, flowering and fruiting throughout the year. The fruits resemble cranberries.

Vaccinium leucanthum, Chamisso.

Mountains of Mexico. An arborescent species. The blackish berries are edible.

Vaccinium macrocarpon, Aiton. (*Oxycoccus macrocarpus,* Persoon.)

The large Cranberry. From Canada to Virginia and Carolina, particularly in sandy and peaty bogs, and in cold mossy swamps. Hardy at Christiania. A trailing evergreen bush with stems attaining a length of 3 feet. In sunny places more fruitful than in shady localities. It is this species, which has become so extensively cultivated in the eastern parts of the United States, where on moory land, often not otherwise to be utilized, enormous quantities of this fruit have been produced by regular culture at a highly profitable scale. The berries are of acid taste, pleasant aroma and the scarlet brightness of the British cranberry, but considerably larger. The plant roots also along its depressed stem, from which it can be readily multiplied.

Vaccinium meridionale, Swartz.

Jamaica, from the summits of the highest ranges down to the coffee-regions. It attains a height of 30 feet, and is evergreen. The small berries are of the taste and colour of those of V. Vitis Idæa.

Vaccinium Mortinia, Bentham.

Mountains of Columbia. A shrub, several feet high. The fruits resemble those of V. Myrtillus, but are more acid. They come to the Quito-market under the name Mortina.

Vaccinium myrtilloides, Michaux.

Michigan, Canada, Newfoundland, Labrador. The large edible berries are called Bluets. This little bush is adapted for alpine country.

Vaccinium Myrtillus, Linné.*

The British Whortleberry or Bilberry. Throughout Europe, Northern and Middle Asia, remotest North-America, extending to the Californian Sierra Nevada; in heathy and turfy forest-land. In Norway it is found wild to lat. 71° 10′ [Schuebeler]. A shrub a few feet high or less, deciduous, erect, of great value for its copious supply of berries. They are, as well known, black with a blui grey hue, rarely white, of exceedingly grateful taste and v

wholesome. Fresh, eaten with milk, one of the most agreeable of all dishes. The naturalisation of this plant on alpine ranges and in cooler woodlands would prove a boon. For raising the plant from seeds, the berries should be dried by lenient warmth, and the seeds be left in the pulp on transmission. Perhaps packing among slit dried figs may also be recommendable, or they might be transmitted in ice-chambers of ships. The berries can be utilized also for their dye. The whole bush contains quina-acid.

Vaccinium ovalifolium, Smith.

North-Western America from Mendocino to Oregon. This shrub bears large edible berries [Dr. Gibbons].

Vaccinium ovatum, Pursh.

Common throughout California, also in British Columbia, at altitudes from 1,000 to 2,000 feet, attaining a height of about 8 feet. It bears its fruit in densely crowded racemes, the dark-blue but small berries being of good flavor. This species would doubtlessly form a valuable accession among cultivated fruits [Gibbons].

Vaccinium Oxycoccus, Linné. (*Oxycoccus palustris,* Persoon.)

The British Cranberry. Throughout Europe, Northern and Middle Asia, North-America; on turf-moss in moory heaths. A creeping evergreen shrub of particular neatness. The berries give a most agreeable preserve, and are of antiscorbutic value. This species is particularly eligible for the spongy, mossy bogs of alpine mountains, where with us also a most profitable culture thus could be initiated. Indigenous in Norway northward to lat 70° 45′.

Vaccinium padifolium, Smith. (*V. Madeirense,* Link.)

Madeira and Azores; 3-4,000 feet high. An arborescent shrub. The berries are not so large as those of V. Myrtillus, but sweeter and collected in clusters [Fr. Hall].

Vaccinium parvifolium, Smith.

North-Western America, from Mendocino to Sitka. A tall shrub. The berries are excellent for preserves.

Vaccinium pendulifiorum, Gaudichaud.

Hawaia, where it is called the "Ohelo." The acidulous berries of this bush are edible.

Vaccinium Pennsylvanicum, Lamarck.[a] (*V. angustifolium,* Aiton.)

The early Blueberry or Blue Huckleberry. North-America, on dry woody hills. A dwarf bush with deciduous foliage, producing fruit in abundance and early in the season. The berries are large, bluish-black and of sweet taste. V. Canadense (Kalm), according to Dr. Asa Gray, is closely allied.

Vaccinium præstans, Rudolphi.

Kamtschatka. A minute plant, but with large delicious fruits. It might perhaps easily be disseminated on any alpine mountains.

Vaccinium reticulatum, Smith.

Hawaia, at elevations from 4,000 to 8,000 feet. A dwarf shrub. Berries somewhat astringent, but of pleasant taste [Dr. Hillebrand]. Related to V. cereum (Forster) from the Tahiti-Mountains.

Vaccinium uliginosum, Linné.

British Bog-Bilberry. Europe, Northern and Middle Asia, North-America. A deciduous bush, with blackish berries, similar to those of V. Myrtillus, but hardly of equal excellence. Wild to lat. 78° north in Greenland

Vaccinium vacillans, Solander.

Eastern North-America, in sandy forest-lands. A deciduous small bush, with its blue berries coming later into season than V. Pennsylvanicum [Dr. A. Gray].

Vaccinium Vitis Idæa, Linné.

Europe, Northern and Middle Asia, North-America. Extends in Greenland to 76° N. L. [Nathorst]; therefore fit for subglacier-regions. A dwarf shrub with evergreen leaves. The purplish-red berries are sought for jellies and other preserves. It is as yet impossible to say, how many other species of Vaccinium produce good-sized and well-flavored fruits. The genus ranges also in tropical species from Continental Asia to the Indian Archipelagus, and has a wide extension likewise in South-America, occupying in hot countries higher mountain-regions; but few reliable notes on the tropical species are extant as far as their fruits are concerned. No attempts seem as yet to have been made, to improve the fruits of any Vaccinium by hybridizing nearly allied species under horticultural care. We here would like to see any one of the kinds, alluded to in these pages, naturalised on the Australian Alps.

Vahea florida, F. v. Mueller. (*Landolphia florida,* Bentham.)

West-Africa, up to 2,500 feet. This may prove hardy in mild extra-tropic regions. Dr. Welwitsch describes the Aboh-fruit of this species as sweet and acidulous, but was not less gratified with the beauty and marvellous abundance of its large snow-white and jasmin-scented flowers. V. florida also yields much caoutchouc, like V. Heudelotii (*Landolphia Heudelotii,* D.C) from the Senegal-regions. The genus Vahea was fully established by Lamarck as early as 1791. The excellent work on the caoutchoucs of commerce by James Collins, may be consulted as regards the sources o various kinds of India-rubbers. Prof. Wiesner (Rohstoffe d Pflanzenreichs, 1873) enumerates at p. 154-156 the various plan then known to yield caoutchouc, giving also a chemical accoun these substances.

Vahea Owariensis, F. v. Mueller. (*Landolphia Owariensis,* Beauvois.)

Tropical West-Africa, but ascending to the highlands of Angola, according to Dr. Welwitsch. This climber, with several other Vaheas, yields the West-African caoutchouc; others furnish the Madagascar-sort, particularly V. gummifera (Lamarck), now cultivated also in India. Prof. Wiesner of Vienna enumerates 47 species of various genera, which yield either rubber, gutta percha or balata. It is said that the addition of ammonia to the sap improves the rubber. V. Owariensis produces edible fruits as large as middle-sized oranges, with sweet and slightly acid pulp.

Valeriana Celtica, Linné.

Alps of Europe; hardy at Christiania. The "Speik." The root of this perennial herb is particularly aromatic.

Valeriana edulis, Nuttall.

North-Western America, from Oregon to the Rocky Mountains. The thick spindle-shaped root of this herb affords food to the natives of that part of the globe. When baked the root proves agreeable and wholesome. When we consider the wild state of the plants, from which many of our important root-crops arose, this Valeriana and several other plants, suggestively mentioned in these pages, may well be admitted for trial-culture.

Valeriana officinalis, Linné.

Europe, Northern and Middle Asia, in swampy grass-land, with a predilection for forests and river-banks. In Norway it extends northward to lat 70° 22′ [Prof. Schuebeler]. This perennial herb would do particularly well on high mountains. It is the only one among numerous congeners of Europe, Asia and America, which is drawn to a considerable extent into medicinal use. The root and herb contain valerianic acid and a peculiar tannic acid; the root furnishes also an essential oil, which again resolves itself into valerol (70 per cent.), valeren, barneol and valerianic acid. Concerning these see Husemann and Hilger's Pflanzenstoffe, 1884. The order of Valerianeæ is not represented by any native plant in Australia.

Valerianella olitoria, Moench.

Lamb's Lettuce. Europe, North-Africa, Northern and Middle Asia. Northward to lat. 59° 16′ in Norway. A fair and early salad-plant. It is an annual and has several congeners in Europe and Asia. V. eriocarpa (Desvaux) is similarly utilitarian. With still more force this may be said of the co-ordinal Fedia cornucopiæ (Gaertner). The seeds will keep about five years [Vilmorin].

Vangueria infausta, Burchell.

From tropical Africa to Natal and Caffraria. The fruit of this shrub or small tree is medlar-like, but superior in taste. Worth test-cultivation with a view of improving the fruit. V. edulis (Vahl) from the warmer regions of Africa and from Madagascar proved hardy as far south as Port Jackson, and yields esculent rather small fruits.

Veratrum album, Linné,

Europe, Northern and Middle Asia, extending eastward to Japan. Hardy still at Christiania. It delights particularly in sub-alpine localities. The root furnishes veratrin, jervin and sabadillic acid; it is used in medicine, particularly for external application.

Veratrum veride, Aiton.

Canada and United States of North-America. A near relative of the former plant. Professor Schuebeler found it hardy in Norway to lat. 71°. Its root has recently come into medicinal use, especially as an arterial sedative [Porcher.]

Verbascum Thapsus, Linné.

The Mullein. Europe, Northern and Western Asia. A biennial herb of some use in medicine, but adapted also for scenic cultural effects.

Veronica Virginica, Linné.

Eastern North-America. A perennial herb, which for medicinal use furnishes the "Culver's-root," from which again the Leptandrin as a chologogue is prepared. The showy shrubby species, such as V. speciosa (R. Cunningham) of New Zealand and their hybrids can easily be multiplied from cuttings in the open air; they are grateful in culture, and afford good material for table-bouquets; they with others may share perhaps in the medicinal value of the American congener mentioned.

Viburnum prunifolium, Linné.

The Black Haw. South-eastern North-America. A tall shrub or small tree. The bark has become deservedly introduced into legitimate and permanent medicinal use; it is a nervine, stimulant, anodyne and antispasmodic.

Virburnum Tinus, Linné.

The Lauristine. Countries around the Mediterranean Sea. An evergreen shrub, one of the earliest flowering of the season; we adapted for ornamental hedges. Hardy in the south of Engla An excellent plant as a standard of comparison for floral calend-

Vicia Cracca, Linné.

Europe, North-Africa, Northern and Middle Asia, North-America; in Norway it extends to lat. 71° 10′. Perennial. Recommendable for naturalisation as a fodder-plant in sylvan and sub-alpine lands. It yields in shade a return three times larger than in open places [Langethal]. A. Carlsson speaks of it most favorably as fitted for wet meadows, after extensive cultural experiences in Finland. Lauded as most nourishing to cattle by Dr. Plot of Staffordshire. The cognate V. Cassubica and V. biennis (Linné) serve also for field-culture.

Vicia Ervilia, Willdenow. (*Ervum Ervilia,* L.)

South-Europe, North-Africa, South-Western Asia. An annual herb, praised as a valuable fodder-plant, particularly fit for dry calcareous soil. Cultivated already at Troja [Virchow, Wittmack].

Vicia Faba, Linné.*

The Straight Bean, called also Common Field-Bean. Orient, particularly on the Caspian Sea. Professor Schuebeler found it to bear seeds still in lat. 67° 17′. Was cultivated already at Troja [Virchow, Wittmack], and during the stone-age in Hungary [A. de Candolle]. Dressing land with sulphate of iron increases considerably the crop [A. B. Griffith]. Bees resort to the flowers of this plant also. This productive annual herb not only affords its seeds for table-use, as Broad Bean and Windsor-Bean, but provides also a particularly fattening stable-food, in its common form the Horse-Bean. Continued and unmixed feeding with this bean causes however finally paralysis in domestic animals. The seeds contain about 33 per cent. starch. V. Narbonensis, L., from South-Europe and South-Western Asia, is preferable for the table, because its seeds contain less bitter principle, though they are smaller. They will retain their vitality for six years or more.

Vicia gigantea, Hooker.

Western North-America. A tall perennial Vetch, serving as a good fodder-herb, and affording in its young seeds a wholesome substitute for peas. The plant fits particularly forest-regions [Asa Gray, T. Christy].

Vicia peregrina, Linné.

South-Europe. Annual. In Italy preferred to the ordinary Tare for sandy soil; recommends itself also for its close growth.

Vicia sativa, Linné.* (V. *angustifolia,* Roth.)

The ordinary Vetch or Tare. Europe, North-Africa, Western and Northern Asia, extending to Japan. According to Professor Schuebeler it will grow in Norway to lat. 70°; it perfected its seeds

there still in 63° 26′. One of the best fodder-plants, but only of one or two years' duration. Praised particularly for dairy-cattle by G. Don. This plant according to Middleton has yielded as large a crop as 12 tons on an acre, cut green. Horses thrive remarkably on it. Important also for green manure and as a companion of clovers. The allied V. cordata, Wulfen, and V. globosa, Retzius, are similarly cultivated in Italy [Langethal]. Many of the other European and Asiatic species of Vicia are deserving of our attention. Sir John Lawes and Prof. J. H. Gilbert enunciated recently their remarkable discovery, that nitrogenous constituents are largely increased in leguminous plants, notably also Vetches, through development of nodules at their roots by micro-organisms, the free nitrogen of which being fixed during the process of assimilation. This symbiosis can probably be aided by extraneous action in so far as bringing nodulated roots or their surrounding soil for initiation of the growth of the microbes to the spots of culture.

Vicia sepium, Rivinus.

Europe, Western and Northern Asia. A perennial Vetch, enduring an alpine clime; indigenous in Norway northward to lat. 69° 40′. It might with advantage be naturalized in forests and on high mountains, but it can also readily be subjected to field-culture, the yield being large and nutritious in regions with humid air, though the soil might be poor. This vetch can be kept continually on the same field for about fifteen years [Langethal]. V. Pannonica, Jacquin, is an allied but annual species.

Vicia Sitchensis, Bongard. (*V. gigantea,* Hooker.)

From California to Sitka. Dr. Asa Gray remarks, that the young seeds of this tall vetch are eatable like green peas.

Vicia sylvatica, Linné.

The Wood-Vetch. Europe, Northern-Asia. Indigenous in Norway to lat. 67° 56′. Perennial. Recommendable to culturists settling in new forest-land; available also for growth in sub-alpine copses. Pasture-animals have a predilection for this vetch; its yield is large and very nourishing. In limestone-soil of forests V. pisiformis and V. dumetorum, Linné, can best be selected for introduction.

Vicia tetrasperma, Koch. (*Ervum tetraspermum,* Linné.)

The Lentil-Tare. Europe, Western Asia, North-Africa. Annual. According to Langethal this species is preferable to the ordinary tare for sandy soil. It is also less hard as fodder and very palatable. Lime in the land enlarges the yield. V. monantha and hirsuta (Koch) serve nearly as well.

Vigna lanceolata, Bentham.

Tropical and sub-tropical Australia. Mr. P. O'Shanesy observes, that this twiner produces, along with the ordinary cylindrical pods, others underground from buried flowers, and these somewhat resemble the fruit of Arachis. The plant might be rendered perhaps available for culinary purposes.

Vigna Sinensis, Endlicher.* (*Dolichos Sinensis,* Rumph.)

The Cherry-Bean, also called Cow-Pea. Tropical Asia and Africa. The cultivation of this twining annual pulse-herb extends to Southern Europe, the United States and many other countries with a temperate clime. Cultivated as Phaseolus and Faseolus already by the ancients [Koernicke]. The pods are remarkable for their great length, to 2 feet or occasionally 3 feet, and used like French beans, dry as well as preferentially also green. This plant bears plentifully even in seasons of severe drought in Central Australia [Rev. H. Kempe]. It is satisfied with comparatively poor soil. V. Catjang, V. unguiculata, V. sesquipedalis and V. melanophthalma are varieties of this species. In fair soil the produce is about forty-fold. The Laubich-grains of Egypt are from a variety of this species [Sir J. Hooker].

Villebrunia integrifolia, Gaudichaud.

India, ascending the Himalayan mountains to 5,000 feet. A small tree, allied to the Ramie-plant (Boehmeria nivea). Mr. C. B. Clarke regards the fibre as one of the strongest available in India, it being used for bow-strings. Other Villebrunias—for instance—V. frutescens, and also some species of Debregeasia, particularly D. velutina—likewise deserve regular culture, for the sake of their fibre. Moist forest-tracts seem particularly adapted for these plants, because V. integrifolia grows in Sikkim at an elevation, where the rainfall ranges from 100 to 200 inches. This fibre is much more easily separable than that of Maoutia Puya, according to Dr. G. King's observations.

Viola odorata, Renealm.

The Violet. Middle and Southern Europe, North-Africa, Western and Middle Asia. In Norway, cultivated to lat. 63° 52′; from this the isothermal line northward of its cultural range can be determined. Passingly alluded to here, as this modest though lovely plant should be extensively naturalised in forest-glens; it furnishes its delicate scent by enfleurage for various compositions of perfumery. It flowers in the southern regions of Australia through the whole of our almost six-monthly spring; much resorted to by bees. The annual produce of flowers from violets, obtained at Nice and Cannes alone, amounts to about 50,000 lbs. According to the *Revue Agricole,* about 200,000 lbs. of violet flowers are annually used for scent in the vicinity of Grasse, where the price

comes to from 15d. to 20d. per lb. Violets are there often grown as an extra-crop under lemon- and orange-trees; the kind chiefly cultivated for perfumery is the "Double Parma" [Piesse]. The concrete oil is a commercial article. Varieties specially cultivated for bouquets are: Lee's Victoria, the Czar and the Neapolitan and Semperflorens. Their culture proves quite remunerative.

Vitex trifolia, Linné.

Warmer parts of Asia and Australia, also Polynesia, extending northward to Japan, southward to New South Wales, eastward to Hawaia. The variety V. ovata (Thunberg) creeps to a radius of 30 feet, holding shifting sand; the more it gets covered over, the more it seems to grow [Joseph O'Reilley].

Vitis acetosa, F. v. Mueller.

Carpentaria and Arnheim's Land. Stems rather herbaceous than shrubby, erect. The whole plant is pervaded with acidity; thus the foliage proved valuable in cases of scurvy. The berries are edible, and vary from white to purple and black. This species, if planted in countries with a mild temperate clime, would probably spring afresh from the roots annually. Mr. Alfred Giles made from this grape some wine of fair quality, reminding of claret.

Vitis æstivalis, Michaux.*

The Summer-Grape of the Middle and Eastern States of North-America. Flowers fragrant. The berries are deep blue, of pleasant taste, and ripen late in the season; they are generally rather small and in some kinds somewhat sour. Little subject to mildew. Among the varieties, derived from this species, the Jacques or Lenoir, Herbemont, Norton's Virginia, Elsinburg, Cunningham, Rulander and Pauline are the best known; all resist the attacks of the Phylloxera vastatrix, as has been fully demonstrated by experience in the United States as well as in the south of France. Several of these give an excellent produce: Jacques and Norton's Virginia gained a first prize in competition with the wines of Southern France, at an exhibition held in Montpellier. The Jacques-variety especially is much esteemed in the Provence for its resistance to Phylloxera, also for its luxuriant growth, great fertility and excellent wine of rich colour. The whole group of Vitis æstivalis is however rather difficult to propagate, and is for this reason not so valuable for stock of the European vine as V. riparia. As these vines are of larger growth than V. vinifera, they should be planted further apart; a distance of 8 or 10 feet, and 6 feet between the rows is considered the most suitable. In Europe the flowering season is at the end of June, about a fortnight later than that of the European vine. The following method has been recommended for propagating these American vines in districts infested by the Phylloxera. Cut the best old stocks of Euro

vines down to six or eight inches underground, graft upon them American scions having at most three eyes, fasten with clay and cover the graft with soil, preferably with sand. To obtain then a number of American vines, cut off any European shoots, which may have sprouted, leave all the best American shoots, make furrows about four inches deep, radiating from the stock, in which layer the shoots, fixing them down with pegs, and cover them with sand. It is to be observed, that in very poor dry soil, where the European vine still yields a fair crop, American vines do not succeed [Planchon, "Vignes Américaines]."

Vitis Arizonica, Engelmann.

This species resembles V. Californica in appearance and rapidity of growth; it resists the attacks of the Phylloxera, and bears drought, but is liable to mildew. Recommended by Prof. E. W. Hilgard of Berkeley to serve as stock for grafting, who mentions besides as Phylloxera-resisting: V. rupestris, V. Romanti, V. Davidi, V. candicans, V. monticola and V. Novo-Mexicana. The two latter, as well as V. Texana and V. Doaniana, have been recommended for dry and hard calcareous soils, in which most other kinds do not thrive so well.

Vitis Baudiniana, F. v. Mueller. (*Cissus Antarctica,* Ventenat.)

East-Australia. With V. hypoglauca the most southern of all species of grapes, none extending to New Zealand. It is evergreen, and a vigorous plant for bowers, but suffers even from slight frosts. The berries are freely produced and edible, though not large.

Vitis Californica, Bentham.

Prof. Hilgard considers this a good species for grafting on to it the European vine, as it is of more rapid growth than V. riparia and resists the Phylloxera; it is however very subject to mildew. It prefers a heavy rich soil. In its native rivular glens it ascends high trees, forming leafy domes or vast festoons in the forests.

Vitis candicans, Engelmann.

The Mustang-Grape of Texas, extending to Florida. Suited for warm dry climes. Climbs to a maximum-height of 80 feet, and gets finally a stem of nearly 2 feet diameter. Bears abundantly. Mr. Buckley obtained from a plant, 8 years old, 54 gallons of juice; but the wine obtained is inferior to that from some other American species. The variety Solonis is derived from crosses between V. riparia, V. rupestris and V. candicans [Prof. Millardet].

Vitis Chantini, Lecard.

From Guinea and Senegambia to Abyssinia, ascending to 5,000 feet. A tall rampant species, producing tubers. Berries edible. V. Faidherbii and V. Hardyi are varieties [Planchon]. Allied to this species is also V. asarifolia (Baker) from the White Nile and Zanzibar.

Vitis cinerea, Engelmann.

Valley of the Middle and Lower Mississipi. Of near affinity to V. æstivalis. A large vine. Resists Phylloxera. Some hybrids from this serve well for stock to graft on [Millardet].

Vitis cordifolia, Michaux.*

The Winter-Grape or Frost-Grape. From Canada to Florida. A very large deciduous vine. The scent of the flowers reminds of Reseda. The berries are small, either blackish or amber-colored and very acid. They can be used for preserves, and are only fully matured when touched by frost. A succession of seedlings may give us a superior vine, with the recommendation of particular hardiness; this species developes however also well in rather warm climes, and bears even considerable dryness. It thrives, like V. monticola, under the tropic of Capricorn in Queensland [J. S. Edgar]. Resists the attacks of Phylloxera very well, and seems also safe against mildew [Professor Millardet].

Vitis hypoglauca, F. v. Mueller.

East-Australia, as far south as Gippsland. An evergreen climber of enormous length, forming a very stout stem in age. The black berries attain the size of small cherries. This species also may perhaps be vastly changed in its fruit by continued culture. Bears slight frost; but it is best in cool climes, to keep seedlings for two or three years under shelter, so that sufficient increment and induration of the woody stem takes place for its resisting subsequently some frost, a remark applying to many other kinds of plants to be acclimatised.

Vitis Indica, Linné.

On the mountains of various parts of India, ascending to an altitude of 3,000 feet in Ceylon. The small berries are edible. The plant should be subjected to horticultural experiments. This is an apt opportunity, to draw attention to some of the various Indian species of Vitis with large edible berries—for instance, V. lævigata (Blume), V. thyrsiflora (Miquel), V. mutabilis (Blume), V. Blumeana (Steudel), all from the mountains of Java, and all producing berries as large as cherries, those of V. Blumeana being particularly sweet. Further may here be inserted V. imperialis (Miquel) from Borneo, V. angulata and V. elongata (Wallich), the latter two from the m

tainous mainland of Coromandel, and all producing very large juicy berries, even in the jungle-wilderness. V. quadrangularis (Linné) stretches from Arabia to India and Central Africa, and has also edible fruits. Many such plants may be far more eligible for grape-culture in hot wet climates than the ordinary vine. About 250 species of Vitis are already known, mostly from intra-tropical latitudes, and mostly evergreen; but in regard to their elevation above the ocean and to the nature of their fruits we are almost utterly without data. An herbaceous species of a tuberous vine, occurring in Soudan, is recommended by Mr. Lécard; another tuberous species is noted by Mr. J. B. Martin as wild in Cochin-China, the herbaceous stems being reproduced annually from the roots; both kinds bear excellent grapes; the species from Cochin-China forms long shoots, sometimes to a length of 60 and exceptionally 150 feet, bearing grapes all along the branches. Occasionally more than a cwt. of grapes is obtained from one plant, according to General Haldeman. It would be a grand acquisition to tropical countries; its ripe grapes are produced successively through fully three months; the berries are very large.

Vitis Labrusca, Linné.*

The Fox-Grape. North-America, from Canada to Texas and Florida, also in Japan. A pale-fruited variety furnishes the Bland's Grape; another yields the American Alexander-Grape [Torrey and Gray]. The Schuylkill, Concord, Catawba, Isabella, Martha, Ives-Seedling, Hartford-Prolific and a number of other less known varieties are also derived from this species. Among these the Concord takes the first rank as well for wine as for dessert-grapes in the Eastern United States, where it is cultivated more than all the other varieties put together, although it has a strong so-called foxy taste. It is not quite proof against the attacks of the Phylloxera vastatrix, but suffers less than most other varieties of this species [Planchon, Vignes Américaines]. Many good and fertile crosses between V. Labrusca and V. vinifera occur in North-American cultivation; the Delaware-Grape is a hybrid from V. Labrusca according to Bush and Meissner, and has in its turn given rise to many other good crosses. The berries of V. Labrusca are large among American kinds, and are of pleasant taste. Flowers fragrant. It is the only species, which thrives well and bears largely in the clime of Brisbane, according to Dr. Bancroft, so far as hitherto ascertained, This and the other hardy North-American vines seem never to be attacked by the Oïdium-disease. Dr. Regel unites the South-Asiatic V. lanata (Roxburgh) with this.

Vitis riparia, Michaux.* (*V. cordifolia* var. *riparia,* A. Gray.)

From the Northern and Central United States to the Rocky Mountains of Colorado. As the name implies, especially a riverside-grape, particularly in loamy soil [Hilgard]. To this species belong

the Clinton, Franklin, Taylor and some other varieties, probably also Vitis Solonis, which seem more particularly destined, to revive viticulture in Southern France and other countries, where the Phylloxera vastatrix has annihilated such a vast extent of vineyards. They serve as a grafting stock for the European vine, the majority of them showing a sufficient if not a complete resistance to this pest, while they are for the most part not difficult to propagate. The experiments, hitherto made in Provence and elsewhere, have given good results, and the produce of the European vine on American stock has been found as good as if grown on its own root. Professor Planchon places the varieties in the following order of merit: Vitis Solonis, Clinton-Vialla or Franklin, wild Vitis riparia, Taylor, Clinton. The York-Madeira, which may be a hybrid between V. riparia and V Labrusca, is by some growers placed next to Vitis Solonis and answers well for grafting. The seedlings of V. Solonis retain the typical characteristics of the parent-plant—which the other varieties do not. To raise vines from seeds, the pips may be taken either before or after fermentation of the grape; the essential point is, not to let them get dry; they should be kept in a cool place and mixed with sand, to prevent mould. For transmission to great distances they should be sent dried in the peel and pulp to ensure the preservation of their vitality. Several French cultivators recommend grafting "by approach." For this purpose an American and an European vine are planted side by side; early in spring, when the shoots are about the size of a small goose-quill, two from the different stocks are brought together, and in the most convenient place a slice is taken out of the bark and the outer portion of the wood of each, about half an inch in length, care being taken that the two surfaces exactly fit each other; they have only to be tied together, the sap, which is then at the height of its flow, soon closing up the wound; the American shoot is pinched off, when it has made three or four leaves; the following winter the root of V. vinifera is cut off. Phylloxera-galls are frequently found on the leaves of V. riparia as well as of V. æstivalis, but the roots are not so often attacked; if the latter happens, the wounds inflicted by the insect are superficial and soon heal up [Planchon, Vignes Américaines]. Dr. M. T. Masters mentions as a curious fact, that Professor Riley found a species of Thrips (T. phylloxeræ) attacking the galls formed on the leaves of American vines by Phylloxera vastatrix. Professor A. Millardet of Bordeaux has in 1885 issued an excellent illustrated work on the principal Varieties and Species of Vines of American Origin resisting the Phylloxera. Messrs. Bush and Meissner of Missouri have also published a very comprehensive work on the American Vines, translated into French by Professor Planchon M. L. Bazille. Mr. T. V. Munson, of the United States Dep ment of Agriculture, has lately published a short account of American species of Vitis, as a preliminary to a future full graph on this subject. At present in the Department H already 170,000 acres are planted with American vine

fortunately the mildew, which has attacked so much the European vine, is equally hurtful to the American species, unless V. rubra and V. cordifolia be proof [Planchon]. However Mr. E. W. Hilgard, of the Agricultural Experimental Station, found V. riparia to be very little attacked by mildew in California. The Phylloxera has now found its way to Algeria, Smyrna and New South Wales, so that all the five great parts of the globe are invaded. The late Prof J. E. Planchon lived to enjoy the triumph of seeing largely the French vineyards, affected by Phylloxera, brought into copious bearing again by grafting on American stock. Professor Millardet, who, with the able assistance of M. de Grasset, has taken a prominent part in hybridising the different species of American vines with each other and also with the European species, is hopeful of overcoming any difficulties, which yet present themselves to the complete regeneration of French vineyards by these hybrids. He estimates, that now already in Southern France two-thirds of the vineyards, destroyed by the Phylloxera, have been replanted with American vines and then grafted; the yield from these is now larger by a fourth, or perhaps even by a third, than before the invasion of the Phylloxera! He saw the extraordinary produce 1,400 gallons of wine from an acre of the variety "Aramons" grafted on Vitis riparia, the soil being of medium quality and deep, the plants grafted four years before.

Vitis rubra, Michaux.

The Cat-Vine. Illinois and adjoining country, on river-banks. May climb to half a hundred feet height. Proof against Phylloxera and Mildew. Promises to become of value for hybridisation [Millardet].

Vitis rupestris, Scheele.

The Sand-Grape or Sugar-Grape. From the Missouri to Texas. Succeeds well at Rockhampton under the tropic of Capricorn [J. S. Edgar]. Likes naturally gravelly borders of torrents, along which elsewhere this species might be naturalized; also at home on hill-sides and rocky knolls. Least subject of all to mildew [Hilgard]. Hybridises easily; also well adapted for grafting on it the European vine [Prof. Millardet].

Vitis Schimperiana, Hochstetter.

From Abyssinia to Guinea. This vine may perhaps become valuable, with many other Central African kinds, for tropical culture, and may show itself hardy also in extra-tropical countries. Barter compares the edible berries to clusters of Frontignac-Grape.

Vitis vinifera, C. Bauhin.*

The Grape-Vine. Greece, Turkey, Persia, Tartary; probably also in the Himalayas. One of the most thankful of plants over a wide cultural range. Praised already by Homer; cultivated in Italy as early as the bronze-age, in Armenia since Noah's time. This is not the place, to discuss at length the great industrial questions concerning this highly important plant, even had these not already engaged the attention of a vast number of colonists for many years. A large territory of West- and South-Australia, also of Victoria and New South Wales stretches essentially through the Vine-zone, and thus most kinds of vine can be produced here, either on the lowlands or the less elevated mountains in various climatic regions and in different geological formations. Among the very few other plants, which passed through years of drought in Central Australia [Rev. H. Kempe]. The best grapes with us are produced mainly between the 30th and 38th degree of latitude. Cultivation for wine advances on the Rhine to 50° north; on trellis it extends to 52° or 53° N., in Norway even to 61° 17'. In Italy vines are often trained high up over maples, willows and elms, since Pliny's time: in the Caucasus they sometimes grow on Pterocarya. Vines attain an age of centuries and get stems 3 feet in diameter. The doors of the dome of the Ravenna-Cathedral are of vine-wood [Soderini]. Tozetti saw a vine with branches extending diametrically, as a whole, over 3,000 feet at Montebamboli. Rezier notes a plant, bearing about 4,000 bunches of grapes annually at Besançon [Regel]. A single plant of "Black Hamburg" under glass at Rockhampton, England, bore annually 900-1,000 lbs. of grapes [Davis]. A vine of enormous magnitude at Hampton-Court has also gained wide celebrity. One of the largest vines in the world is growing at Oys (Portugal), which covers an area of 5,315 feet, and the stem near the base measures over 6 feet in circumference. It was planted in 1802, and gave in 1862 grapes for 165 gallons of wine, in 1874 for 146 gallons (Journal Society of Arts). A vine near Santa Barbara, California, which was planted 68 years ago by a Mexican, has a stem-diameter of one foot, the branches covering an area of 12,000 square feet: it produces 10,000 to 12,000 lbs. of grapes annually [H. Gardner]. Another grape-vine, growing in the same district, measures 5 feet 10 inches in stem-circumference and has produced 4 tons of grapes in a year [Meehan]. Instances are on record of bunches of grapes having attained a weight of 20 lbs.; those of Canaan, alluded to in holy scripture, must have been still heavier. In Italy the establishing of vine-plantations on ordinary culture-land is regarded as enhancing the value of the latter four or five fold, and elsewhere often even more (whereas cereal-land is apt to deteriorate), provided that vine-diseases can be kept off. The imports of wine into the United Kingdom in 1886 amounted to about 15 million gallons, worth more than £5,000,000, of which only a very small proportion came from British colonies. The wine imported into Victoria in 1887 was valued at £128,000, that exported at £29,000. In 1885,

France had nearly 5 million acres of land planted with vines, yielding close upon 700,000,000 gallons of wine; the acreage and produce of Italy were not much less. The Bulletin de Statistique states that, the production of wine in France for the year 1890 amounted to 603 million gallons. In Italy, where the devastations by the Phylloxera have not been quite so great, the yield was 621 million gallons according to the returns published by the Minister of Agriculture. Chili produces about 33 million gallons per annum. Major B. C. Trumon estimated the yield of Los Angeles, California, at 17 million gallons in 1888. The production of raisins in that state reached in 1889 already 28 million lbs.

The Corinthian variety, producing the currants of commerce, also thrives well in some districts of extra-tropic Australia, where with raisins its fruit may become a staple-article of export beyond home-consumption. The Sultana-variety is not to be much pruned; the bunches when gathered are dipped in an alkaline liquid obtained from wood-ashes, to which a little olive-oil is added, to expedite drying, which is effected in about a week [G. Maw]. The produce of sultana-raisins fluctuates from 7 to 30 cwt. per acre. The plant is best reared on limestone-formations. In Greece the average-yield of ordinary raisins is about 2,000 lbs. per acre [Simmonds]. Besides the Sultana also Muscat of Alexandria and Malvoisie à gros grains are used for good raisins. By continued crossing of the Sultana-variety, perhaps other seedless kinds might yet be originated. Britain imported in 1889 1,173,000 cwts. of currants valued at £1,420,000, and 573,000 cwts. of raisins valued at £910,000. The currants imported into Victoria in 1887 were valued at nearly £80,000; raisins £36,000. An extensive special work of great value on the raisin-industry has been issued in 1890 by Professor Gustav Eisen, in San Francisco. Dr. W. Hamm, of Vienna, has issued a Vine-map of Europe, indicating the distribution of the different varieties and the principal sources of the various sorts of wine. The writer would now merely add, that the preservation of the grapes in a fresh state, according to M. Charmeux's method, and the sundry modes of effecting the transit of ripe grapes to long distances, ought to be turned to industrial advantage. The Almeria-variety has lately been introduced by the South-Australian Government; this kind is distinguished for keeping well, and is largely sent from Spain to the English market [Dr. Muecke]. The pigment of the dark wine-berries is known as racemic acid. The juice contains along with tartaric acid also grape-acid. All these chemically defined substances have uses of their own in art and science. As is well known, the grape-vine is subject to the attacks of various insect- and fungus-pests. The most destructive by far is the insect called the Phylloxera vastatrix. None of the remedies hitherto suggested seem to have proved really effective, or they are not of sufficiently easy and cheap application, and the Phylloxera thus is still rapidly on the increase in Europe.

according to late accounts one-third of all the vineyards of France were affected, and the disease is also spreading in Italy, Spain, Germany, Austria, Hungary, Algeria, Syria and South-Africa. The most effectual method of combating this enemy in France has been found in grafting the ordinary grape-vine on stocks of several American species of Vitis. It may be worthy of trial, how far the grape-vine can be grafted on such other species, not American, as may not be attacked by the Phylloxera. Professor Monnier, of Geneva, has introduced the very expansive sulphurous anhydrous acid gas against the Phylloxera. The cultivation of insecticidal herbs, to check the ingress of Phylloxera, should be more extensively tried, as such plants might ward off the insect at all events in its wingless state. Dr. Herman Behr suggests for the mitigation of this plague the ignition of wood near vineyards, when the insect is on its wings, as all such insects seek fires, and succumb in them largely, the attraction to the fiery light being greatest when the sky is overcast, or when the nights are without moonlight. Mr. Leacock, in Madeira, applies a coating of a sticky solution of resin in oil of turpentine advantageously to the roots of Vines affected by Phylloxera. Dr. Clemm extols an application of easily decomposed carbonates or sulphids to the soil with subsequent addition of any diluted acid, whereby the suffocating carbonic acid gas or the sulphuret of hydrogen is formed and liberated, the resulting salts in their turn to reinvigorate and nourish the suffering plant [Dr. G. Krause]. Successive broods of Phylloxera maintained their vitality on remnants of Vine-roots for six years and more. Inundation to the depth of a few inches for about a month, where that is practicable, completely suffocates the Phylloxera, but renders the vine for a while much less productive. In sandy soil this dreadful insect is retarded in its development, action and progress. Bisulphide of carbon has proved an efficient remedy; this expansive fluid is introduced into the soil by a peculiar injector or through porous substances (wood, earth), saturated with the bisulphide, the cost of this operation being, in France, £3 10s.-£4 per acre annually. [Planchon, David, Marion, Robart. See also translations by K. Staiger and A. K. Findlay.] Dressing with sulpho-carbonate of potassium is still more efficacious and less dangerous, but involves an annual expenditure of about £8 per acre [W. T. Dyer]. Sand might be dug in at the roots of vines, which may be in imminent danger of becoming a prey of Phylloxera. Recently it has been insisted on by Mr. Bauer, of San Francisco, that it would be best to put minute quantities of mercury, triturated with chalk, near the roots of vines affected with Phylloxera, a measure which deserves every consideration, as the particles of quicksilver would only very gradually become dissolved, and long remain stationary; and we know that metal in its solutions to be the most powerful antiseptic, a dilution of one part of bichloride of mercury in 5,000 parts of water proving strong enough for surgical purposes, It is reported from California likewise, that there cereals seem also attacked by Phylloxera

Little's soluble Phenyl is among the remedies recommended by the chief viticultural officer in San Francisco against the insect. The Phylloxera vastatrix and also its ova succumb at a heat of 113° F. already [Couasnon and Solomon]; thus by a careful heating of the soil the insect and its eggs may be destroyed without hurting the plant dangerously. Among the fungus-pests the too well-known Oidium is effectually checked by repeated application of powdered sulphur. The mildew, Peronospora viticola, is another dreaded enemy and has caused heavy losses. To Professor Millardet, of Bordeaux, the credit is due of having first made known an effectual remedy, namely, by syringing the diseased vines with a solution of sulphate of copper or sulphate of copper and lime—1 lb. sulphate of copper to 20 gallons of water. Professor Baillon however states, that this remedy against the mildew has in many cases not proved so efficaceous as was expected, but that a combination of sulphate of copper and ammonia not only destroyed the Peronospora, but at the same time greatly stimulated the growth of the vines. Mr. Alfred Tait observes, that in Portugal preference is given over the Bordeaux-fluid to the dry application of a powder containing the substances of that mixture (sulphate of copper, lime and sulphur) as prepared by him for subduing the Peronospora. The Bordeaux-mixture has also proved the best remedy against Black Rot, which is caused by Laestadia Bidwellii and some allied Fungs, such as Phoma uvicola and Phyllosticta Labruscæ. The Black Rot-disease, which works great havoc among the vines in the United States in moist districts, is hardly noticed in regions with a dry climate [Scribner and Viala]. Mr. J. Sisley found a solution of 6 lbs. of common salt in 100 quarts of water effective. Another form of mildew has made its appearance on vines in Victoria, viz., Erysiphe vitigena (Cooke and Massee); in the eastern coast-districts of Australia also the blight of the vine-leaves, arising from Pestalozzia uvicola (Spegazzini) has been found. Vitis Davidii (Planchon) may belong to the wild varieties of the ordinary grape-vine; it was discovered in Western Skensi (34° North, 108° 50′ East) up to 11,000 feet elevation; the same wild plant was sent from Kinhua, by Consul Cooper, as a prickly vine and as bearing large purple grapes; several other species of Vitis exist in the cooler regions of China [Hemsley]. In tropical countries vines should be strongly manured, to make them productive [C. Merton]. Travellers through new temperate regions might include closely kept vine-seeds among those to be disseminated. Cream of Tartar is obtained from sediments, incrusted during fermentation of Grape-juice or storage of wine. From this sediment, mainly bitartrate of potassium, is separable tartaric acid through removing the alkaline base by sulphuric acid.

Vitis vulpina, Linné.* (*Vitis rotundifolia,* Michaux.)

The Muscadine- or Fox-Grape. South-Eastern States of North-America; extends also to Japan, Manchuria and the Himalayas.

This species includes as varieties the Bullace, the Mustang, the Bullate-Grape and both kinds of the Scuppernongs. The berries are of pleasant taste, but in some instances of strong flavor; they are the largest among American grapes. All the varieties derived from Vitis vulpina are perfectly proof against the attacks of Phylloxera vastatrix. Although in infected districts a few insects may sometimes be found on it, yet no ill effects are ever manifested. The flowering season is about six weeks later than that of the European vine. This species is not easily propagated from cuttings, but must be raised from seeds or by layering. As this is a very large species, the vines should be planted 20 to 30 feet apart, and grown in bower-fashion or on trellises. It does not bear pruning, but some of the superfluous wood may be trimmed off during summer. It is only suited for mild climates; even in the latitude of Washington it succumbs to the cold, being thus not hardy like most other North-American species in Northern Germany. The bunches contain generally only from 4 to 10 large berries, but are produced abundantly all over the plant. The berries are of a brownish-yellow color with a bronze-tinge when ripe: the peel is coriaceous, the juice vinous, of delicate perfume resembling muscat. The grapes do not ripen together, but successively during about a month, and drop off the stalk when ripe. To gather them a sheet is generally spread under the vine and the latter shaken. The Muscadine vine grows sometimes to an extraordinary size, rising to the top of the tallest trees. A Scuppernong, planted on the island of Roanoke, covers the almost incredible area of more than 40 acres; another is mentioned by M. Labiaux as extending still further. Vitis vulpina is not suited for stock, on which to graft the European vine [Planchon]. Hybrids of this species with the European and with other American vines are but little fertile, but by further crossing the first hybrids can furnish fertile sorts, whereas crosses between Vitis vinifera, V. æstivalis, V. cordifolia, V. riparia and V Labrusca in any way are hardly less fertile than the original species [Bush and Meissner]. Dr. Regel refers to V. vulpina also V. parviflora, Roxburgh. The important memoirs "Les Vignes Américanes," published by Planchon since 1875, should be consulted in reference to American vines.

Voandzeia subterranea, Thouars.

Madagascar and various parts of Africa, as far south as Natal. This Earth-Pea is annual, and pushes its pods underground for maturation in the manner of Arachis hypogæa. The pods are edible and consumed in some tropical countries. The crop from this plant has been particularly rich in Arnheim's Land, never less than a hundred fold. The seeds, soaked in water for a night and then boiled, afford a nutritive and palatable food [M. Holtze]. Each pod has generally only one seed, somewhat larger than a pea. [*Dr.* Henkel].

Waitzia corymbosa, Wendland.

Deserts of Australia. Sheep are particularly fond of this herb and soon get fat on it [Mrs. M. Heal].

Wallichia caryotoides, Roxburgh. (*Harina caryotoides,* Hamilton.)

India, up to 4,000 feet elevation [Kurz]. A dwarf tufted palm, eligible for scenic group-planting.

Wallichia densiflora, Martius. (*W. oblongifolia,* Griffith.)

Himalaya as far as 27° north. There one of the hardiest of all palms. It is not a tall one, yet a graceful and useful object for cultural industries.

Washingtonia filifera, H. Wendland. (*Pritchardia filifera,* Linden.)

From South-California to Arizona and Colorado. One of the most northern and therefore most hardy of American palms. This species attains a height of about 50 feet. In gardens it passes often under the name Brahea filamentosa. Thrives well near Melbourne [C. French]. W. robusta (H. Wendland) occurs near the Sacramento-River, and will endure long-continued drought as well as a few degrees of frost [Prof. Naudin]. This is one of the most beautiful among hardy Palms.

Wettinia augusta, Poeppig.

Peru, on mountains several thousand feet high. This palm is therefore likely to endure mild, temperate climes.

Wettinia Maynensis, Spruce.

Cordilleras of Peru. Like the foregoing, it attains a height of about 40 feet, and advances to elevations of 3,000 to 4,000 feet.

Before finally parting from the American palms, it may be appropriate to allude briefly to some of the hardier kinds, which were left unnoticed in the course of this compilation. From Dr. Spruce's important essay on the Palms of the Amazon-River may be learned that, besides other species as yet imperfectly known from the sources of this great river, the following kinds are comparatively hardy, and hence might find places for cultivation or even naturalisation within the limits of extra-tropical countries: Geonoma undata (Klotzsch), Iriartea deltoidea (Ruiz and Pavon), Iriartea ventricosa (Martius), which latter rises in its magnificence to fully 100 feet; Iriartea exorrhiza (Martius); this, with the two other Iriarteas, ascends the Andes to 5,000 feet. Oenocarpus multicaulis (Spruce) ascends to 4,000 feet: from six to ten stems are developed from the same root, each from 15 to 30 feet high. Of Euterpe two species occur in a zone between 3,000 and 6,000 feet. Phytelephas microcarpa (Ruiz and Pavon) ascends to 3,000 feet on the eastern slope of the Peru-Andes. Phytelephas macrocarpa (R. & P.) grows also on the eastern side of the Andes, up to

4,000 feet; it is this superb species, which yields by its seeds much of the vegetable ivory. Phytelephas æquatorialis (Spruce) occurs on the western slope of the Peruvian Andes, up to 5,000 feet; this palm is one of the grandest objects in the whole vegetable creation, its leaves attaining a length of 30 feet! The stem rises to 20 feet. Palm-ivory is also largely secured from this plant. Though equinoctial, it lives only in the milder regions of the mountains. Carludovica palmata (R. & P.), on the eastern side of the Andes of Peru and Ecuador ascends to about 4,000 feet; the fan-shaped leaves from cultivated specimens furnish the main-material for the best Panama-hats. Count de Castelnau saw many palms on the borders of Paraguay during his great Brazilian expedition. Most of these, together with the palms of Uruguay and the wide Argentine territory, would probably prove adapted for acclimation in mild temperate latitudes; but hitherto the limited access to those countries has left us largely unacquainted with their vegetable treasures also in this direction. Von Martius demonstrated so early as 1850 the occurrence of the following palms in extra-tropical South-America: Juania australis (H. Wendland), on high mountains in Juan Fernandez, at 30° south latitude; Jubœa spectabilis (Humboldt), in Chili, at 40° south latitude; Trithrinax Brasiliana (Mart.), at 31° south latitude; Copernicia cerifera (Mart.), at 29° south latitude; Acrocomia Totai (Mart.), at 28° south latitude; Cocos australis (Mart.), at 34° south latitude; Cocos Yatai (Mart.), at 32° south latitude; Cocos Romanzoffiana (Chamisso), at 28° south latitude; Diplothemium littorale (Mart.), at 30° south latitude. All the last-mentioned palms occur in Brazil, the Acrocomia and Trithrinax extending to Paraguay, and Cocos australis to Uruguay and the La Plata-States.

While some palms, as indicated, descend to cooler latitudes, others ascend to temperate and even cold mountain-regions. Among the American species are prominent in this respect—Euterpe andicola (Brongniart), E. Haenkeana (Brongn.), E. longivaginata (Mart.), Diplothemium Porallyi (Mart.) and Ceroxylon pithyrophyllum (Mart.), all occurring on the Bolivian Andes at an elevation of about 8,000 feet. Ceroxylon andicola (Humboldt), Kunthia montana (Humb.), Oreodoxa frigida (Humb.) and Geonoma densa (Linden), also reach on the Andes of New Granada an elevation of 8,000 feet. Ceroxylon Klopstockia (Mart.) advances on the Andes of Venezuela fully to a zone of 7,500 feet altitude, where Karsten saw stems 200 feet high, with leaves 24 feet long. There also occur Syagrus Sancona (Karsten) and Platenia Chiragua (Karsten), at elevations of 5,000 feet, both very lofty palms, and both recently reduced by Sir Joseph Hooker to the genus Cocos. From the temperate mountain-regions of sub-tropical Mexico are known, among others, Chamædorea concolor (Mart.), Copernicia Pumos (Humb.), C. nana (Kunth) and Brahea dulcis (Mart.), at elevations of from 7,000 to 8,000 feet.

Wissadula rostrata, Planchon.

Tropical Africa and America. A perrennial somewhat shrubby plant, easily naturalised in frostless regions. The bark abounds in serviceable fibre; and as the plant shoots quickly into long simple twigs, if cut near the root, fibre of good length is easily produced [Dr. Roxburgh].

Wistaria Chinensis, De Candolle.

The "Fuji" of Japan and China. Hardy still at Christiania. Lives through a century and more. The stem is carried up straight, and the branches are trained on horizontal trellises at Japanese dwellings, affording shade for seats beneath. One Wistaria-tree will thus cover readily a square of 50 feet by 50 feet, the delightfully odorous trusses of flowers pendent through the trellis overhead [Christy]. Fortune tells us of a tree of great age, which measured at 3 feet from the ground 7 feet in circumference, and covered a space of trellis-work 60 feet by 100 feet. At Sunningdale (England) a single plant covers a wall 9 feet high for a length of 340 feet [J. B. Torry]. Flowers probably available for scent-distillation.

Wistaria frutescens, Candolle. (*W. speciosa,* Nuttall).

South-Eastern States of North-America. A woody tall-climbing plant, of grand value with the preceding species for bees.

Withania coagulans, Dunal.

Mountains of India. A somewhat shrubby plant. With the fruit milk can be coagulated into curd for cheese, as with rennet; the active principle, according to Mr. Sheridan Lee, is best extracted by a weak aqueous solution of kitchen-salt. Galium verum (Linné) of Europe, Asia and North-Africa, a perennial rubiaceous herb, serves also for rennet, probably with other species of that genus and of Asperula.

Withania somnifera, Dunal.

Countries around the Mediterranean Sea, thence to South-Asia and South-Africa. A half-shrub. The root, according to Professor McOwan, acts much like that of Podophyllum medicinally.

Witheringia solanacea, l'Héritier.

South-America. This perennial herb is deserving of trial-culture on account of its large edible tubers.

Xanthorrhiza apiifolia, L'Héritier.

Eastern North-America. A perennial, almost shrubby plant, of medicinal value. The root produces a yellow pigment similar to that of Hydrastis Canadensis. Both also contain berberin.

Xanthorrhœa Tatei, F. v. Mueller.

Kangaroo-Island. One of the largest of the so-called "Australian Grass-trees," and one of the best for furnishing the fragrant resin of this genus of plants, that product being in demand for particular sorts of varnishes, for the manufacture of sealing-wax, for picric acid, which it yields in large percentage, for coloring walls as an admixture to lime, and for some other technologic purposes. Approximate London-price now £8 for the ton, according to Mr. Will. Somerville. Resin is also commercially exported from X. australis (R. Brown) of Tasmania and Victoria, from X. resinosa (Persoon) of N.S. Wales and Queensland, from X. quadrangulata (F. v. M.) of South-Australia, from X. Preissii (Endlicher) of West-Australia, and from X. hastilis (R. Brown) of New South Wales. Mechanical redissemination should be effected, wherever the plants largely become sacrificed for obtaining the resin, the annual collection of which will yield a good and permanent income. For technologic and geographic notes on various Xanthorrhœas see also "Zeitschrift des oesterreich. Apotheker-Vereins xxiii., 293-295 (1885)." As regards their culture they require to be amply provided with soil, best of a somewhat sandy and moory nature. X. quadrangulata can be grown among rocks, X. Preissii on ordinary pasture-soil.

Xanthosoma sagittifolium, Schott.

West-Indies. The tubers are largely cultivated there, and used as an esculent like those of Colocasia. The plant may be as hardy as the latter.

Xanthoxylon piperitum, De Candolle.

Used as a condiment in China and Japan. Fruit-capsules remarkably fragrant.

Ximenia Americana, Linné.

Tropical Asia, Africa and America, passing the tropics however in Queensland, and gaining also an indigenous position in Florida. This bush may therefore accommodate itself to cooler climes in localities free from frost. The fruits are edible, resembling yellow plums in appearance; their taste is agreeable. The wood is scented. In Mexico called "Alvarillo del campo." Mr. P. O'Shanesy recommended this shrub for hedges.

Xylia dolabriformis, Bentham.

The "Pyengadu" of India, extending to China and the Phillipine-Islands, ascending mountains to 3,000 feet. An Acacia-like tree, attaining a height of about 120 feet, the stem often clear up to about 80 feet and of very considerable girth. Foliage deciduous. The wood is reddish-brown, close-grained, and pervaded when fresh by an oily glutinous clamminess. The heartwood is of greater durability than even teak, and of a marvellous resistance

to shocks through its extreme hardness. It is used for gun-carriages, crooks of ships, railway-sleepers, tools, gauges, ploughs, house- and bridge-posts [Laslett]. Almost as indestructible as iron, hence locally called ironwood; a rifle shot at 20 yards distance will scarcely cause any penetration into it [Colonel Blake]. Neither the teredo nor termites will touch the heartwood [Sir J. Hooker]. It can only be sawn up in a fresh state. The stem exudes a red gum-resin [Kurz]. This tree yields also saponin.

Yucca aloifolia, Linné.

Carolina, Florida, West-India, Mexico, in coast-sand. Stem to 20 feet high. With its congeners a fibre-plant.

Yucca angustifolia, Pursh.

From Missouri and Iowa to Colorado, Arizona and New Mexico. Height according to Mr. Green to about 15 feet. One of the hardiest of all.

Yucca baccata, Torrey.

Colorado, Texas, Southern California, Utah, Northern Mexico. In its ordinary state not tall; but the variety Y. filifera (Chabaud) will sometimes produce a stem half a hundred feet high with a diameter to 3 feet. The leaves are singularly short [S. Watson]. This furnishes the Tambico-fibre for cordage, ropes, rugs and other fabrics.

Yucca brevifolia, Engelmann.

Southern California, Arizona and Utah, in the deserts, ascending to 4,000 feet. Attains a height of 30 feet. The whole plant can be converted into paper [Vasey, Baker].

Yucca filamentosa, Linné.

The Adam's Needle. From Maryland to Florida. An almost stemless species. It would hardly be right, to omit the plants of this genus altogether here, as they furnish a fibre of great strength, similar to that of the Agaves. Moreover, all these plants are decorative, and live in the poorest soil, even in drifting coast-sand. They are also not hurt, as is the case with the Fourcroyas, by slight frosts.

Yucca gloriosa, Linné.

Carolina and Florida, along the sandy coast-tracts. Stem not tall, but leaves very numerous. The fibre of the leaves furnishes much material for rope, to supply the wants for ships and boats locally. Yucca-ropes are lighter, stronger and more durable than those of hemp [H. M. Brackenridge]. At Edinburgh the plant bore a temperature of 0° F. with impunity [Gorlie]: yet the Yuccas generally prosper also in tropical countries.

Yucca Guatemalensis, Baker.

Mexico and Guatemala. Acquires finally a height of about 20 feet. Regarding the specific characteristics of the various Yuccas see particularly Baker's descriptions in the journal of the Linn. Soc. 1880.

Yucca Treculiana, Carriere.

From Texas to Mexico. Stem to about 50 feet high, branched only near the summit. Grand in aspect and also most showy on account of its vast number of white flowers of porcelain-lustre. The fruit tastes like that of the Papaw [Lindheimer].

Yucca Yucatana, Engelmann.

Mexico. This species attains a height of about 25 feet, branching from the base. Y. canaliculata (Hooker) ranges from Texas to North-Mexico, and has a stem up to 25 feet high, with very long leaves.

Zalacca secunda, Griffith.

Assam, as far north as 28°. A stemless palm with large feathery leaves, exquisitely adapted for decorative purposes. Before we quit the Asiatic palms, we may learn from Von Martius' great work, how many extra-tropical members of this princely order were already known in 1850, when that masterly publication was concluded. Martius enumerates as belonging to the boreal extra-tropical zone in Asia: *From Silhet, at 24° north latitude*: Calamus erectus, Roxb.; C. extensus, Roxb.; C. quinquenervius, Roxb.;—*from Garo, at 26° north latitude*: Wallichia caryotoides, Roxb.; Ptychosperma gracilis, Miq.; Caryota urens, L.; Calamus leptospadix, Griff.;—*from Khasya, in 26° north latitude*: Calamus acanthospathus, Griff.; C. macrospathus, Griff.; Plectocomia Khasyana, Griff.; *from Assam about 27° north latitude*: Areca Nagensis, Griff.; A. triandra, Roxb.; Livistona Jenkinsii, Griff.; Daemonorops nutantiflorus, Griff; D. Jenkinsii, Griff; D. Guruba, Mart.; Plectocomia Assamica, Griff.; Calamus tenuis, Roxb.; C. Flagellum, Griff.; C. Heliotropium, Hamilt.; C. floribundus, Griff.; Phœnix Ouseloyana, Griff.; *from Upper Assam between 28° and 29° north latitude*: Caryota obtusa, Griff.; Zalacca secunda, Griff.; Calamus Mishmeensis, Griff.—*from Darjiling at 27° north latitude*: Wallichia obtusifolia, Griff; Licuala peltata, Roxb.; Plectocomia Himalaiana, Griff; Calamus schizospathus, Griff.;—*from Nepal, between 28° and 29° north latitude*: Chamærops Martiana, Wall.;—*from Guhrwall, in 30° north latitude*: Calamus Royleanus, Griff.;—*from Saharanpoor, in 30° north latitude*: Borassus flabelliformis, L.;—*from Duab, in 31° north latitude*: Phœnix sylvestris, Roxb.;—*from Kheree, in 30° north latitude*: Phœnix humilis, Royle;—*from Dekan*: Bentinckia Coddapanna, Berry, at an elevation of 4,000 feet. Miquel mentions as palms of Japan (entirely extra-tropical: Rhapis

flabelliformis, Aiton; R. humilis, Blume; Chamærops excelsa, Thunb.; Livistona Chinensis, Br. and Arenga saccharifera. Labill. or a species closely allied to that palm.

Zea Mays, Linné.*

The Maize or Indian Corn. Indigenous to the warmer parts of South-America. St. Hilaire mentions as its native country Paraguay. A. de Candolle believes it to have come originally from New Granada. Found—as cultivated—in Central America already by Columbus. This conspicuous, though annual cereal grass interests us on this occasion as being applicable to far more uses than those, for which it has been employed in most parts of the globe. In North-America, for instance, maize is converted into a variety of dishes for the daily table, being thus boiled in an immature state, as "green corn." Mixed with other flour it furnishes good bread. For some kinds of cakes it is solely used, also for maizena, macaroni and polenta. Several varieties exist, the Inca-Maize of Peru being remarkable for its gigantic size and large grains; the variety nana is very hardy, having matured seeds in Norway as far north as 63° 13' according to Professor Schuebeler. Some varieties in wet tropical countries ripen grain within six weeks from the time of sowing. Maize is not readily subject to the ordinary corn-diseases, but to prosper its requires fair access to potash and lime. Good writing and printing papers can be prepared from maize-straw. Meyen calculated, that the return from maize under most favorable circumstances in tropical countries would be eight hundred fold, and under almost any circumstances it is the largest yielder among cereals in warm countries. Acosta counted on some cobs of the Inca-Maize as many as 700 grains, and says that it is not uncommon to harvest of this variety 300 fold of the seeds sown; it grows to a height of 15 feet in rich soil and under careful cultivation, by which means the grains will become four or five times as large as the ordinary kind. In Peru it can be grown up to an altitude of 8,000 feet. Mr. Buchanan, of Lindenau, obtained 150 bushels of ordinary maize from an acre in Gippsland-flats, colony Victoria. In the litoral region of North-Queensland three harvests can be obtained within a year from some varieties. Even in the very dry clime of the Murray-River districts maize, but under irrigation, has yielded 80 bushels per acre [D. Cormack]. Prof. Blount succeeded in growing a hardy variety of maize in Colorado at an elevation of 5,000 feet [W. Farrer.] From the stalks of ordinary maize, after the ripened grains have been plucked, sugar at the rate of 900 lbs. per acre is still obtainable (Department of Agriculture, Washington). Maize has come into use for alcoholic distillation. In 1879 already the United States produced 1,547,900,000 bushels of maize on 53 millions of acres, to the value of 580 million dollars or about £120,000,000. In 1882 the maize-produce there was 1,617,000,000 bushels, from 68,800,000 acres, realising monetarily 783,867,000 dollars, equal to £163,000,000; in 1890 the yield was 1,490,000 bushels. The

import of Corn-flour and Maizena into Victoria during 1887 came to 434,575 lbs., valued at £9,681. Maize-grain will retain its power of germination for two years with certainty. As a fattening saccharine green-fodder, maize is justly and universally in warm countries appreciated. In America much used for ensilage. In Middle Europe the Horse-tooth variety is frequently grown for this purpose, and attains occasionally a height of fully 12 feet, although the seeds do not come to perfection there. Any ergot from it is used, like that of rye, for medicinal purposes. Maize-corn contains about 75 per cent. of starch. Dierbach recommends mellago or treacle from maize instead of that prepared from the roots of Triticum repens, L., and the molasses so obtained serves also for culinary uses. Sugar and treacle are now made on a large scale from maize-stems in the manner indicated under Andropogon saccharatus. Exposure to extreme and protracted cold—four years in Polaris Bay, Smith Sound, 81° 38′ north latitude—did not destroy the vitality of wheat- and maize-grains [R. J. Lynch]. The elongated thread-like styles have come recently into medicinal use. The occasional attacks of particular kinds of rust, smut and blight must be overcome by the same measures, adopted against similar parasitic fungs on wheat. Ustilago Maydis (Corda) can in particular become extensively destructive to maize-crops.

Zelkova acuminata, Planchon. (*Planera acuminata,* Lindley; *P. Japonica,* Miquel; *Zelkova Keaki,* Savatier and Franchet.)

The "Keaki" Japan. Considered one of the best timber-trees there: height up to 160 feet; stem-diameter to 10 feet [Prof. Luerssen]. Likes calcareous soil. It proved of rapid growth and valuable as a shade-tree also at Melbourne. The wood never cracks, and is hence most extensively used for turnery, also much for furniture [Rein]. For out-door work the most valued wood in Japan [Christy].

Zelkova crenata, Spach. (*Planera Richardi,* Michaux.)

South-Western Asia, ascending to 5,000 feet. In favorable localities a good-sized tree, with qualities resembling those of the elms. Growth of comparative celerity. Resists severe frosts. Its tendency to form straight and tall stems with few and short branches is evident. Attains an age over 200 years; rate of growth about 2 feet a year. Medwedieff calls this tree the pearl of the Caucasian forests. The propagation is either from seeds or layers or cuttings [H. Scharrer]. The wood is pale-yellowish and streaked, tough and elastic, heavy, hard, fine-grained, neither rends nor warps; also under ground never infested by insects, almost imperishable. The allied Z. Cretica (Spach) is restricted to South-Europe.

Zingiber officinale. Roscoe.

The Ginger. India and China. Possibly this plant may be productive also in the warmer temperate zone, and give satisfactory results. In Jamaica it is cultivated up to an elevation of 3,500 feet [W. Fawcett]. The multiplication is effected by division of the root. For candied ginger only the young succulent roots are used, which are peeled and scaled prior to immersion into the saccharine liquid; but Galanga root is similarly used. Great Britain imported in 1884 about 56,000 cwt. of ginger, valued at £124,000.

Zizania aquatica, Linné. (*Hydropyrum esculentum,* Link).

The Canada-Rice. In shallow streams and around ponds and lakes, from Canada to Florida. Annual. This grass might be readily naturalised. It attains a height of 9 feet. Although its grain can be utilised for bread-corn, we would wish to possess the plant chiefly, to obtain additional food for water-birds.

Zizania fluitans, Michaux. (*Hydrochloa Carolinensis,* Beauvois).

Southern States of North-America. This grass, floating in shallow streams, or creeping on muddy banks of rivers or swamps, is praised by Prof. C. Mohr as valuable for fodder, lasting throughout the year.

Zizania latifolia, Turczaninow. (*Hydropyrum latifolium,* Grisebach).

The Kau-sun of China. In lakes of Amur, Manchuria, China and Japan. Regarded by Bentham as conspecific with Z. aquatica. From Dr. Hance we know, that the solid base of the stem forms a very choice vegetable, largely used in China, where this tall water-grass undergoes regular cultivation like the Trapa.

Zizania miliacea, Michaux.*

Southern part of North-America, West-Indies. Tall and perennial, more restricted to the tidewater-meadows and ditches, according to Pursh; while according to Chapman's note it is generally distributed like Z aquatica, with which it has similar use. In Southern Brazil occurs a similar if not identical grass—namely Z. microstachya (Nees).

Zizyphus chloroxylon, Oliver.

The Cogwood-tree. Jamaica, in mountainous regions. Height considerable. Wood greenish, ponderous, hard, tough, durable also in water. Splendid for cogs, machinery [Sloane, Browne. See Dyer's Kew-Bulletin, June, 1889].

Zizyphus Joazeiro, Martius.

Brazil, Recommended as yielding edible fruit in arid regions.

Zizyphus Jujuba, Lamarck.

From India to China and East-Australia, extending also to tropical Africa, ascending the Himalayas to 4,500 feet. This shrub

or tree can only be expected to bear its pleasant fruits within the temperate zone in warm regions. The fruit is red or yellow and of the size of a cherry; it ripens in the milder regions of Victoria. The Tussa-silkworm, which according to Dr. Forbes Watson is the most important and widely distributed of the wild silk-insects of India, feeds on Z. Jujuba, but also on Terminalia, Shorea, Bombax heptaphyllum (Cavanilles) and some other trees; often its cocoons are merely collected in the forests.

Zizyphus Lotus, Lamarck.

Countries around the Mediterranean Sea. The fruits are small and less sweet than those of Z. vulgaris; nevertheless they are largely used for food in the native country of this bush, and are quite a staple-product for the local fruit-markets there [Dr. Shaw]. Z. nummularia (Wight and Arnott) is an allied species from the mountains of India, ascending to about 3,000 feet. It is much used for garden-hedges. The fruit is sweet, acidulous and of a pleasant flavor [Sir D. Brandis].

Zizyphus Mistal, Grisebach.

Argentina. A fine tree with edible fruits.

Zizyphus rugosa, Lamarck.

Nepal and other mountainous parts of India. A small tree, hardier than Z. Lotus. The fruit of this is also edible, and the same may be said of a few other Indian species.

Zizyphus Sinensis, Lamarck.

China and Japan. Similar in use to the last.

Zizyphus Spina Christi, Willdenow.

Middle and North-Africa, South-Western Asia. Rather a hedge-plant than a fruit-bush.

Zizyphus vulgaris, Lamarck.

Orient, particularly Syria, extending to China; in the Himalayas up to 6,500 feet. A small tree, adapted for a mild temperate clime. Fruits scarlet, about an inch long, with edible pulp; they are known as South-European Jujubes. The allied Z. oxyphylla (Edgeworth) has a very acid fruit.

Zoysia pungens, Willdenow.

Eastern and Southern Asia, East-Australia. This creeping grass, although not large, is important for binding coast-sands; it will live on saline soil, and can also be utilised as a lawn-grass, choking out most other grasses. Relished by stock.

Number of plants, primarily recorded, 2,485. Very many besides secondarily mentioned.

ADDITIONS.

Alnus acuminata, Humboldt.

From Mexico to Chili, particularly at subalpine elevations. There among the best of artisans'-trees [Rev. Prof, Sodira].

Hypoestes moschata. F. v. Mueller & Holtze.

Arnheims Land. This perennial herb is pervaded by a singularly penetrating musk-scent, so that from the foliage a powerful cosmetic can be distilled, the odorous principle not being subject to chemical decomposition through gentle heat. [W. Carr-Boyd].

Medicago tuberculata, Willdenow.

Countries at the Mediterranean Sea. This herb, though annual, deserves special attention of pasturalists in mild climes, as its fruits never become spinular, although they are somewhat rough. M. turbinata (Willdenow) from the same region is recommended from California for meadows; but it is less worthy of choice, because even its smooth-fruited state might turn at any subsequent time into the spinular variety known of this species, and thus injure fleeces of depasturing sheep.

Musa Basjoo, Siebold and Zuccarini.

Riu-Kiu Islands, therefore entirely extratropic. This species has the stately habit of M. paradisiaca, but is much more hardy. It requires but slight protection in the mildest part of England. In an utilitarian aspect it is a fibre-plant, and is thus frequently cultivated in Southern Japan [J. G. Baker].

Panicum plicatum, Lamarck.

Southern Asia, Madagascar. This spacious broad-leaved grass proved hardy as far south as Port Phillip. Pasture-animals, particularly horses, are fond of it [J. E. Dixon].

TABLE OF AVERAGES AND EXTREMES OF TEMPERATURE OF AIR IN VICTORIA.

***Furnished by the** Melbourne-Observatory.*

Stations.	Yearly Mean Temperature.		Extreme Maximum Temperature.		Extreme Minimum Temperature.	
	Years.	Fahr.	Years.	Fahr.	Years.	Fahr.
		°		°		°
Cape Otway	28	55·2	22	108·0	22	30·0
Portland	14	56·8	23	108·0	23	27·0
Melbourne	33	57·5	33	111·2	33	27 0
Cape Schanck	5	57·3	8	100·0	8	30·0
Wilson's Promontory ...	15	56·4	13	104·0	14	30·0
Gabo-Island	21	58·0	12	94·0	13	32·0
Ballarat	30	54·3	29	114·0	29	22 0
Birregurra	8	54·9	8	103·0	8	28.0
Macedon	16	53·2	1	96·0	2	28·0
Upper Macedon	13	48·6	13	98·0	13	23·0
Sunbury	9	56·3	11	107·7	10	25·0
Berwick	24	57·2	...	...	...	...
Stratford	12	57·1	12	110·0	12	22·0
Stawell	19	57·8	20	120·0	22	25·0
Dimboola	4	57·8	4	116·0	4	20·0
Sandhurst	28	58.7	29	117 4	28	27·5
Clunes	8	55·6	11	113·0	8	23·0
Cashel	8	60·3	9	111·0	9	25·0
Beechworth	14	56·2	14	111·0	14	26·0
Echuca	8	60·2	9	111·0	9	28·0
Yarrawonga	11	60·4	11	112·0	11	25·0
Omeo	9	53.3	9	107·0	12	16·5

TABLE OF AVERAGE ANNUAL RAINFALL IN VICTORIA.

Furnished by the Melbourne-Observatory.

District or Basin.	Names of Stations.	Amount.	Years.
		inches.	
West Coast	Cape Otway	35.12	28
	Portland	32.85	30
	Warrnambool	26.02	15
	Glenhuntly, Macarthur ...	31.61	11
South Coast	Geelong	20 01	21
	Wyndham	20·61	17
	Melbourne	25 98	35
	Tyabb, Hastings	31·50	17
	Cape Schanck	29·79	10
East Coast	Wilson's Promontory ...	43·39	18
	Port Albert	26·18	25
	Gabo Island	38·10	30
Glenelg and Wannon ...	Hamilton	25·64	22
	Glenthomson	27·43	13
	Casterton, Retreat... ...	24·75	6
Hopkins River and Mount Emu Creek	Ercildoune, Burrumbete ...	25·47	16
	Ararat	22·71	28
	Yalla-Y-Poora, Streatham ...	22·42	12
	Wickliffe	21·96	10
	Keilambete, Terang ...	30·13	11
Mount Elephant and Lake Corangamite	Camperdown	30·49	23
	Rokewood	21·47	19
	Poligolet, Derrinallum ...	22·74	10
	Mount Bute, Lintons ...	24.74	13
	Pirron Yallock	27·68	9
Moorabool and Barwon rivers	Buninyong	39·77	32
	Ballarat	26·86	30
	Birregurra	33·00	18
	Stony Creek Reservoir ...	25·17	14
	Murdeduke, Winchelsea ...	20·85	11
	Lovely Banks Reservoir ...	18·52	14
	Mount Gellibrand	23·37	10
Saltwater and Werribee Rivers	Macedon	35·59	16
	Romsey	27·37	6
	Blackwood	39·82	12
	Sunbury	22·91	11
	Ballan	31·39	13
	Bacchus Marsh	19·46	9
Yarra River and Dandenong Creek	Yan Yean Reservoir ...	25·45	35
	Warrandyte	36·15	20
	Berwick	39 02	24
	Ferntree Gully	43·33	17
	Kew	29·60	22
	Gembrook	47·00	11
	Dandenong	31·66	12
	Yering	33·97	8
	Beenak	64·54	12
	Warburton	54·58	12

TABLE OF AVERAGE ANNUAL RAINFALL IN VICTORIA—*continued.*

District or Basin.	Names of Stations.	Amount.	Years.
		inches.	
Mitchell and Latrobe rivers	Sale	25·36	15
	Stratford	27·00	13
	Rosedale	26·20	12
	Warragul	46·75	12
	Maffra	26·00	13
	Grant	45·81	10
	Bairnsdale	27·66	11
Lowan Shire and Mallee ...	Warracknabeal	14·45	17
	Neuarpurr, Apsley ...	22·75	10
Wimmera River	Stawell	20·96	22
	Horsham	17·04	17
	Halls Gap, Grampians ...	33·66	17
	Dimboola	15·59	12
Avon and Richardson rivers	Banyenong, Donald ...	15·76	14
	Wallaloo, Glenorchy ...	16·72	11
	Warranooke, Glenorchy ...	17·46	13
Loddon River	Daylesford	36·05	20
	Sandhurst	21·78	29
	Castlemaine	24·59	15
	Newlyn	28·73	14
	Clunes Weir	23·09	14
	Barker's Creek Reservoir ...	25·93	14
	Expedition Pass Reservoir ...	26·06	14
	Crusoe Reservoir	22·92	14
	Maryborough	20·28	13
	Maldon	25 01	12
	Clunes	21·48	12
	Tragowell Station ...	14·10	11
	Lake Meran Station ...	14·46	8
	Durham Ox	15·16	9
	Kerang	14·35	11
Campaspe River and Lake Corop	Kyneton	31 99	17
	Malmsbury Reservoir ...	25·89	15
	Sutton Grange Reservoir ...	31·19	15
	Trentham	39·69	11
	Whroo	23·72	13
	Metcalfe	26·23	12
Goulburn and Broken rivers	Kaarimba, north of Shepparton	20·49	24
	Shepparton	18·70	13
	Alexandra	28·72	12
	Cashel	22·14	11
	Edenvale, Strathbogie Ranges	44·08	9
Ovens River	Beechworth	32·40	19
	Wangaratta	24·82	12
Mitta Mitta and Kiewa rivers	Omeo	25·13	11
Murray River	Wahgunyah	21·91	20
	Piangil	13·96	17
	Coonange	20·30	6
	Pannoobamawn	17·52	15
	Chiltern	24·78	12
	Picola	17·64	10
	Echuca	18·23	12
	Yarrawonga	20.22	11

GENERA INDICATING:

Alimentary Plants—

1. Yielding Herbage (culinary)—

Agriophyllum, Allium, Amarantus, Anthriscus, Apium, Aralia, Atriplex, Barbarea, Basella, Beta, Bongardia, Borrago, Brassica,* Campanula, Caulanthus, Chamærops, Chenopodium, Claytonia, Corchorus, Crambe, Cynara, Eremurus, Euchlæna, Gelidium, Gigantochloa, Gracilaria, Gunnera, Hibiscus, Lactuca,* Lepidium, Montia, Musa, Œnanthe, Pharnaceum, Physorrhynchos, Pringlea, Pugionium, Rheum, Rumex, Sanguisorba, Scandix, Schizostachyum, Scorzonera, Silene, Spinacia,* Talinum, Tetragonia, Theligonum, Tropæolum, Valerianella, Zizania.

2. Yielding Roots (culinary)—

Allium,* Alpinia, Alstroemeria, Amorphophallus, Apios, Apium, Aponogeton, Arracacha, Asparagus,* Bambusa, Bassowia, Beta,* Boussingaultia, Brassica,* Butomus, Campanula, Carum, Chærophyllum, Cichorium, Colocasia,* Conopodium, Cordyline, Crambe, Cymopterus, Cyperus, Daucus,* Dendrocalamus, Dioscorea,* Diposis, Eustrephus, Ferula, Flemingia, Flueggea, Geitonoplesium, Gigantochloa, Gladiolus, Heleocharis, Helianthus, Hypochœris, Ipomœa,* Iris, Manihot,* Microseris, Nelumbo, Nepeta, Ophiopogon, Oxalis, Pachyrrhizus, Peucedanum,* Pimpinella, Plectranthus, Pouzolzia, Priva, Psoralea, Pueraria, Raphanus, Rhaponticum, Ruscus, Scilla, Scolymus, Scorzonera, Sechium, Selinum, Solanum,* Stachys, Stilbocarpa, Thapsia, Tinguarra, Tragopogon, Triglochin, Tropæolum, Ullucus, Uvularia, Valeriana, Witheringia, Xanthosoma.

3. Yielding Cereal Grain—

Andropogon,* Avena,* Coix, Eleusine, Hordeum,* Oryza,* Panicum, Pennisetum, Poa, Secale,* Triticum,* Zea,* Zizania.

4. Yielding Table-Pulse—

Cajanus,* Canavalia, Caragana, Cicer,* Cyamopsis, Dolichos,* Ervum,* Lupinus, Mucuna, Phaseolus,* Pisum,* Psophocarpus, Vicia,* Vigna.

5. Yielding various Esculent Fruits—

Aberia, Acanthosicyos, Achras, Acrocomia, Adansonia, Actinidia, Adenostemum, Agriophyllum, Akebia, Albizzia, Alibertia, Amarantus, Amelanchier, Anona, Arachis,* Araucaria, Aristotelia, Artocarpus, Asimina, Atalantia, Averrhoa, Bactris, Benincasa, Berberis, Bertholletia, Borassus, Brabejum, Canavalia, Carica, Carissa, Carya,* Casimiroa, Castanea,* Castanopsis, Celtis, Ceratonia, Cereus, Cervantesia, Citrus,* Coccoloba, Cocos,* Condalia, Cornus, Corylus,* Corynocarpus, Corynosicyos, Crataegus, Cucumis,* Cucurbita,* Cudrania, Cupania, Cynara,

GENERA INDICATING—*continued.*

Debregeasia, Diospyros,* Doryalis, Euclea, Eugenia, Fagopyrum,* Ficus,* Fragaria,* Fuchsia, Gaultiera, Gaylussacia, Gingko, Gourliaea, Guevina, Hancornia, Helicia, Hibiscus, Holboellia, Hovenia, Hymenæa, Illippe, Juglans,* Juniperus, Kunzea, Lapageria, Limonia, Macadamia, Maclura, Mammea, Mangifera,* Marliera, Melicocca, Mesembrianthemum, Monstera, Moringa, Morus,* Musa,* Myrica, Myrtus, Nageia, Nelumbo, Nephelium, Niemeyera, Nuphar, Nyssa, Ochrocarpus, Olea,* Opuntia, Pappea, Parinarium, Passiflora, Peireskia, Persea, Peumus, Phœnix,* Photinia,* Phyllanthus, Physalis, Pinus, Pistacia,* Prunus,* Psidium,* Punica, Pyrularia, Pyrus,* Quercus, Ribes,* Rubus,* Salpichroma, Sambucus, Santalum, Sechium, Shepherdia, Solanum,* Spondias, Sterculia, Stylidium, Tamarindus, Telfairia, Terminalia, Trapa, Triphasia, Vaccinium,* Vahea, Vangueria, Vitis,* Voandzeia, Ximenia, Zizyphus.

6. TRUFFLES, MUSHROOMS AND OTHER FUNGS—

Agaricus,* Boletus, Cantharellus, Clavaria, Coprinus, Cortinarius, Exidia, Fistulina, Helvella, Hydnum, Lycoperdon, Morchella,* Pachyma, Peziza, Polygaster, Polyporus, Rhizopogon, Russula, Terfezia, Tremella, Tuber.*

Avenue-Plants (partly also for street-planting)—

Acacia, Acer,* Æsculus,* Ailantus, Albizzia, Angophora, Araucaria, Arbutus, Brachychiton, Callitris, Calodendron, Camellia, Castanea, Celtis, Corylus, Corynocarpus, Cryptomeria, Cupressus, Eucalyptus,* Ficus,* Flindersia, Fraxinus, Gingko, Gleditschia, Grevillea,* Jubæa, Juglans,* Melia, Oreodoxa, Pinus,* Pircunia, Pistacia, Planera, Platanus,* Populus,* Prunus, Pyrus, Quercus,* Robinia, Salix, Sequoia, Thespesia, Tilia,* Tristania, Ulmus,* Zelkova.

Bamboo-Plants—

Arundinaria, (Arundo) Bambusa,* Beesha, Chusquea, Dendrocalamus,* Gigantochloa, Guadua, Melocalamus, Melocanna, Phyllostachys, Shizostachyum (many other genera mentioned under Schizostachyum), Teinostachyum, Thamnocalamus.

Calendar-Plants, also otherwise utilitarian—

Arundo, Camellia, Colchicum, Convallaria, Corylus, Crocus, Cytisus, Helleborus, Myrtus, Photinia, Polyanthus, Prunus, Pyrus, Ribes, Salix, Sambucus, Syringa, Viburnum, Viola, Vitis, Wistaria.

Camphor-Plant—

Cinnamomum.*

Coffee-Plant—

Coffea.*—Substitues: Cischorium, Cola, Paulinia.

GENERA INDICATING—*continued.*

Condiment-Plants—

Acorus, Allium,* Apium, Archangelica, Artemisia, Asperula, Benincasa, Borrago, Brassica,* Calamintha, Calyptranthes, Canella, Capparis,* Capsicum,* Carum,* Chærophyllum, Cinnamomum,* Citrus,* Clausena, Cochlearia, Cola, Coleus, Coriandrum, Crithmum, Cucumis, Cuminum, Curcuma, Fœniculum, Glycine, Illicium, Laserpitium, Laurus, Lepidium, Lindera, Mentha,* Meriandra, Monarda, Monodora, Myrrhis, Nepeta, Nyssa, Ocimum, Olea, Origanum, Peucedanum, Pimenta, Pimpinella, Prunus, Pycnanthemum, Salvia, Satureja, Seseli, Sison, Smyrnium, Spilanthes, Tropæolum, Thymus, Tuber, Valerianella, Xanthoxylon, Zingiber.*

Cork-Plants—

Quercus*.—Substitutes: Æschynomene, Agave, Nyssa.

Dye-Plants—

Acacia, Acer, Albizzia, Aleurites, Alkanna, Alnus, Anthemis, Baloghia, Baptisia, Basella, Berberis, Betula, Bixa, Cæsalpinia, Caragana, Carthamus, Carya, Chlorogalum, Cladrastris, Coccoloba, Coprinus, Crocus, Crozophora, Cudrania, Curcuma, Cytisus, Dracæna, Excæcaria, Fagopyrum, Fraxinus, Garcinia, Gunnera, Hæmatoxylon,* Hedera, Helianthus, Heterothalamus, Indigofera,* Isatis, Juglans, Lawsonia, Lithospermum, Lyperia, Maclura, Maharanga, Mallotus, Onosma, Opuntia, Peireskia, Peltophorum, Perilla, Peumus, Phyllocladus, Pinus, Polygonum, Quercus, Reseda, Rhamnus, Rhus, Roccella, Rubia*, Sambucus, Saponaria, Solanum, Sophora, Spartium, Terminalia, Thymelæa, Vaccinium, Xanthorrhiza.

Edging-Plants—

Anthemis, Buxus,* Chrysanthemum, Pelargonium, Rosa,* Rosmarinus, Stenotaphrum, Thymus, Viola.

Embankment-Plants—

Ceanothus, Cynodon,* Medicago, Mesembrianthemum, Panicum, Paspalum, Salix, Stenotaphrum.*

Fibre-Plants—

Agave,* Ananas, Andropogon, Apocynum, Araujia, Arenga, Artocarpus, Beschorneria, Bœhmeria,* Broussonetia, Camelina, Cannabis,* Caryota, Chlorogalum, Chrysopsis, Copernicia, Corchorus,* Cordyline, Crotalaria,* Cyperus, Debregeasia, Epicampes, Eryngium, Fitzroya, Fourcroya, Gossypium,* Hardwickia, Helianthus, Hibiscus, Humulus, Lardizabala, Lavatera, Linum,* Malachra, Maoutia, Musa,* Pachyrrhizus, Phormium,* Pipturus, Poa, Sanseviera, Sesbania, Spartina, Spartium, Thuya, Tillandsia, Touchardia, Urena, Villebrunia, Yucca. (See also Paper-plants).

GENERA INDICATING—*continued.*

Fullers-Plant—

Dipsacus.

Fodder-Plants—

1. GRASSES—

Agrostis, Aira, Alopecurus,* Andropogon,* Anthistiria,* Anthoxanthum, Aristida, Arundinaria, Arundinella, Astrebla,* Avena,* Bouteloua, Briza, Bromus,* Buchloa, Calamagrostis, Chionachne, Chloris, Cinna, Cynodon,* Cynosurus, Dactylis,* Danthonia,* Ehrharta, Eleusine, Elionurus, Erianthus, Eriochloa, Euchlæna,* Festuca,* Hemarthria, Hierochloa, Holcus, Hordeum,* Kœleria, Leersia, Lolium,* Melica, Milium, Muehlenbergia, Neurachne, Oryzopsis, Panicum,* Pappophorum, Paspalum, Pennisetum,* Phalaris, Phleum,* Poa,* Rottboellia, Sclerachne, Secale,* Sesleria, Spartina, Spinifex, Tripsacum, Trisetum, Triticum,* Uniola, Zea,* Zizania.

2. HERBAGE AND FOLIAGE—

Acacia, Achillea, Alchemilla, Anabasis, Anthyllis, Arachis, Arundo, Astragalus, Atriplex,* Brassica,* Casuarina, Chenopodium, Cichorium, Conospermum, Crotalaria, Cytisus, Desmodium, Eruca, Ervum, Exomis, Galega, Helichrysum, Helipterum, Heracleum, Hippocrepis, Jacksonia, Kennedya, Kochia,* Lathyrus, Lespedeza, Lotus, Lupinus,* Medicago,* Pentzia, Peucedanum, Phymaspermum, Plantago, Portulacaria, Prangos, Salix, Sanguisorba, Selago, Sesbania, Spergula, Stenopetalum, Symphytum, Tragopogon, Trichodesma, Trifolium,* Triglochin, Trophis, Waitzia.

3. ROOTS—

Beta,* Brassica,* Daucus,* Helianthus, Solanum.*

4. STABLE-PULSE—

Cajanus, Cicer,* Dolichos, Lupinus, Phaseolus, Pisum, Vicia.*

5. OTHER FRUITS—

Argania, Carya, Castanea, Ceratonia,* Fagus, Helianthus, Prosopis, Quercus.

Garland-Plants—

Apium, Baccharis, Cupressus, Hedera, Helichrysum, Helipterum, Laurus, Lycopodium, Melaleuca,* Pinus, Pittosporum, Prunus, Rubus, Quercus, Taxus.*

Grave-Plants—

Acacia, Agonis, Boronia, Cupressus, Dacrydium, Exocarpus, Fraxinus, Helichrysum, Helipterum, Lycopodium, Populus, Rosa, Salix,* Sophora, Tamarix, Thuya, Ulmus, Viola.

GENERA INDICATING—*continued.*

Gum-Plants—

Acacia,* Albizzia, Astragalus,* Bambusa, Brachychiton, Caragana, Diospyros, Olea, Piptadenia, Prosopis, Xylia.

Hedge-Plants—

Aberia, Acacia, Acer, Aegle, Agave, Albizzia, Alnus, Asparagus, Azima, Baccharis, Bambusa, Berberis, Buddlea, Cæsalpinia, Capparis, Carissa, Ceanothus, Celtis, Citrus, Cornus, Cratægus,* Cudrania, Cupressus, Cytisus, Elæagnus, Euonymus, Flacourtia, Gleditschia, Guilandina, Hymenanthera, Ilex, Justicia, Lantana, Lawsonia, Ligustrum, Lycium, Maclura, Mimosa, Opuntia, Paliurus, Parkinsonia, Peireskia, Pisonia, Pistacia, Pittosporum, Plectronia, Prosopis, Prunus, Punica, Pyrus, Rhamnus, Rhus, Rosa,* Rubus Ruscus, Salix, Scutia, Streblus, Thuya, Viburnum, Ximenia, Zizyphus.

Honey-Plants—

Acacia, Acer, Æsculus, Agave, Albizzia, Angophora, Audibertia,* Avicennia, Barbarea, Borrago, Brassica, Buddlea, Carya, Castanea, Catalpa, Cephalanthus, Cerinthe, Citrus, Cratægus, Crepis, Crocus, Cucurbita, Cytisus, Diospyros, Dipsacus, Echinops, Echium, Ervum, Eucalyptus, Eucryphia, Eupatorium, Fagopyrum, Gleditschia, Gossypium, Grevillea, Hedera, Hedysarum, Helianthus, Lavandula,* Liriodendron, Lupinus, Marrubium, Medicago, Melilotus, Melaleuca, Melianthus, Melissa, Mentha, Monarda, Musa, Nepeta, Ocimum, Origanum,* Ornithopus, Onobrychis, Peireskia, Photinia, Prenanthes, Prostanthera, Protea, Prunus, Pyrus, Reseda, Rhamnus, Ribes, Rhus, Robinia, Rosa, Rosmarinus, Rubus, Sabal, Salix, Salvia, Sanguinaria, Taraxacum, Teucrium,* Thymus, Tilia, Trichostema, Trifolium,* Tropæolum, Vicia, Viola.

Hop-Plant—

Humulus.*

Insecticidal-Plants—

Agave, Ailantus, Aloe, Artemisia, Cannabis, Chrysanthemum, Eucalyptus, Fagopyrum, Gymnocladus, Matricaria, Melia, Nicotiana, Prunus, Ricinus, Rosmarinus, Schkuhria, Solanum, Tagetes, Tropaeolum.

Irrigation-Plants—

Andropogon, Avena, Bambusa, Boehmeria, Brassica, Cannabis, Citrus, Cucumis, Cucurbita, Euchlæna, Festuca, Gossypium, Humulus,* Juglans, Lolium, Medicago, Olea, Onobrychis, Oryza,* Panicum, Phleum, Phœnix, Phormium, Poa, Prunus, Pyrus, Rubus, Salix, Trifolium, Vitis, Zea.

Longevity-Plants—

Acer, Æsculus, Araucaria, Argania, Betula, Borassus, Casimiroa, Castanea, Celtis, Citrus, Cocos, Cryptomeria, Cupressus, Dammara, Dracæna, Eucalyptus, Enterpe, Fagus, Ficus, Fitzroya, Gingko, Hedera, Hymenæa, Ilex, Juglans, Juniperus, Libocedrus, Olea, Phœnix, Pinus, Platanus, Populus, Pyrus, Quercus, Robinia, Rosa, Salix, Sequoia, Swietenia, Tamarindus, Taxodium, Taxus, Thuya, Tilia, Todea, Ulmus, Vitis, Wistaria, Zelkova.

Manure-Plants—

Brassica, Fagopyrum, Lavatera, Lupinus, Melilotus, Panicum, Spergula, Symphytum, Vicia.

Medicinal Plants—

1. Yielding Herbage or Flowers—

Achillea, Aconitum,* Agave, Aletris, Aloe,* Althæa, Anemone, Anthemis, Apocynum, Arctostaphylos, Aristolochia, Arnica, Artemisia, Atropa,* Baptisia, Barosma, Borrago, Cannabis, Carica, Cassia, Catha, Chelidonium, Chelone, Chenopodium, Chrysanthemum, Cochlearia, Collinsonia, Conium, Convallaria, Crocus, Cytisus, Datisca, Digitalis,* Duboisia, Echinops, Erythroxylon,* Eupatorium, Fabiana, Garuleum, Grindelia, Hagenia, Hamamelis, Hedeoma, Hyoscyamus,* Ilex, Justicia, Lactuca, Leonotis, Leyssera, Lippia, Marrubium, Matricaria, Melia, Melianthus, Mentha, Menyanthes, Micromeria, Nepeta, Ocimum, Osmitopsis, Parthenium, Pilocarpus, Polygala, Prunus, Rafnia, Ricinus,* Rosmarinus, Ruta, Salvia, Sambucus, Santolina, Schkuhria, Sebæa, Selinum, Solanum, Sophora, Spigelia, Spilanthes, Swertia, Tanacetum, Tarchonanthus, Teucrium, Thuya, Thymus,

2. Yielding Bark—

Achras, Ailantus, Alstonia, Aspidosperma, Canella, Cedrela, Cinchona,* Cornus, Gonioma, Juglans, Melia, Pilocarpus, Salix, Syringa, Viburnum.

3. Yielding Roots—

Acorus, Actæa, Althæa, Anacyclus, Apocynum, Archangelica, Aristolochia, Arnica, Atropa, Carex, Cephaelis, Cichorium, Cimicifuga, Colchicum,* Convolvulus, Datisca, Daucus, Ferula, Gentiana, Glycyrrhiza,* Helleborus, Hydrastis, Inula, Ipomœa, Krameria, Leontice, Nardostachys, Panax, Periandra, Peucedanum, Pimpinella, Piscidia, Podophyllum,* Polygala, Punica, Rafnia, Rheum,* Rubus, Sabbatia, Sanguinaria, Saponaria, Sassafras, Saussurea, Schœnocaulon, Scorzonera, Smilax, Smyrnium, Stillingia, Stylosanthes, Symphytum, Taraxacum, Tulipa, Urginia, Valeriana, Veratrum, Withania, Xanthorrhiza.

GENERA INDICATING—*continued.*

4. YIELDING FRUITS (or only Seeds)—

Aegle, Brassica, Carica, Cassia, Cola,* Croton, Cucumis, Cuminum, Ecballion, Eugenia, Fœniculum, Gynocardia, Illicium, Joannesia, Laurus, Mallotus, Œnanthe, Papaver,* Persea, Punica, Rhamnus, Ricinus,* Schœnocaulon, Simaba, Smyrnium, Strophanthus, Tamarindus, Trigonella.

Oil-Plants—

Aleurites, Arachis, Argania, Brassica,* Camelina, Camellia, Cannabis, Carthamus, Carya, Combretum, Corylus, Cucumis, Cucurbita, Cyperus, Elæis,* Eruca, Exæcaria, Fagus, Ginkgo, Gossypium,* Guizotia, Helianthus, Joannesia, Juglans, Linum,* Litsea, Olea,* Papaver, Prunus, Pyrularia, Ricinus,* Sesamum,* Telfairia. [For distilled oils see scent-plants].

Palm-Plants—

Acanthophœnix, Acrocomia, Arenga, Bactris, Bacularia, Borassus, Brahea, Calamus, Calyptronoma, Caryota, Ceroxylon, Chamædora, Chamærops,* Cocos,* Copernicia, Diplothemium, Dypsis, Elæis, Euterpe, Geonoma, Hyphæne, Jubæa,* Kentia,* Livistona,* Mauritia, Oncosperma, Oreodoxa, Phœnix,* Plectocomia, Prestoa, Pritchardia, Ptychosperma,* Rhapidophyllum, Rhapis, Sabal, Serenoa, Thrinax, Trithrinax,* Wallichia, Washingtonia, Wettinia, Zalacca (many other American genera under Wettinia, many other Asiatic genera under Zalacca).

Paper-Plants—

Arundo, Bambusa, Broussonetia, Cyperus, Fatsia, Lepidosperma, Lygeum, Phormium,* Pinus, Populus,* Psamma, Salix, Spartina, Stipa,* Zea. (See also Fibre-plants).

Rennet-Plants—

Acanthosicyos, Cynara, Withania.

Resin-Plants (including India-Rubber, Gutta-Percha, Catechu and Kino Plants)—

Acacia, Achras, Adesmia, Araucaria, Balsamodendron, Belis, Boswellia, Bursera, Butea, Cajanus, Callitris,* Castilloa,* Cedrela, Ceroxylon, Chloroxylon, Chrysophyllum, Cistus, Cocosmanthus, Croton, Dammara,* Dorema, Eucalyptus,* Ferula, Ficus,* Garcinia, Hancornia, Hevea,* Hymenæa, Illippe, Imbricaria, Juniperus, Liquidambar, Manihot, Melanorrhœa, Mimusops, Myrica, Palaquium,* Payenia, Pinus,* Pistacia, Pterocarpus, Rhus, Shorea, Sideroxylon, Styrax, Torreya, Trachylobium, Vahea, Xanthorrhœa.

GENERA INDICATING—*continued.*

Saline Plants—

Agrostis,* Albizzia, Alopecurus, Atriplex,* Avicennia, Batis, Cæsalpinia, Casuarina, Cynodon, Cyperus, Eurotia, Exomis, Hemarthria, Hordeum,* Kochia,* Leptospermum, Melaleuca,* Myoporum, Mesembrianthemum, Panicum, Paspalum, Phœnix, Phormium, Poa,* Prosopis, Salicornia, Sesuvium, Spartina, Sporobolus, Tamarix, Terminalia, Zoysia.

Sandcoast-Plants—

Acacia, Agrostis, Ailantus, Alkanna, Aloe, Anabasis, Andropogon, Apium, Asparagus, Atriplex, Baccharis, Beta, Borassus, Cæsalpinia, Cakile, Calamagrostis, Callitris, Carex, Casuarina, Ceanothus, Coccoloba, Crambe, Crithmum, Cupressus, Cynodon, Cytisus, Dactylis, Distichlis, Ehrharta, Elegia, Elymus,* Festuca, Genista, Glaucium, Hippophæ, Imperata, Kunzea, Launæa,* Lavandula, Lepidosperma, Leptospermum, Lupinus, Medicago, Melaleuca, Mesembrianthemum, Myoporum, Myrica, Opuntia, Ornithopus, Oxytropis, Panicum, Paspalum, Phormium, Pinus,* Plantago, Poa, Populus, Prunus, Psamma,* Quercus, Remirea, Rhagodia, Robinia, Sabal, Salix, Scirpus, Sesuvium, Spartina, Spinifex, Stenotaphrum, Stipa, Tamarix, Tetragonia, Thouarea, Thrinax, Tripsacum, Triticum, Ulex, Uniola, Urginea, Vitex, Yucca, Zoysia.

Scenic Plants [other than Palms or Bamboos and otherwise utilitarian]—

Agave,* Ailantus, Aloe, Alsophila, Andropogon, Angelica, Arundo,* Berberis, Bœhmeria, Canna, Cereus, Colocasia, Cordyline,* Cornus, Cyathea, Cycas, Cynara, Cyperus, Datura, Dicksonia, Dirca, Dracæna, Elegia, Encephalartos, Euchlæna, Eustrephus, Fatsia, Ferula, Festuca, Fœniculum, Fourcroya,* Gunnera, Helianthus, Heracleum, Inula, Jacaranda, Lantana, Lavatera, Leucadendron, Magnolia, Melianthus, Monstera, Musa, Opuntia, Pandanus, Paulownia, Phormium,* Pipturus, Podachænium, Rheum, Richardia, Ricinus, Todea, Tonchardia, Watsonia, Yucca,* Zea.

Scent-Plants—

Acacia, Adesmia, Aloexylon, Andropogon, Anthoxanthum, Aquilaria, Asperula, Backhousia, Boronia, Bouvardia, Buddlea, Caesalpinia, Calamintha, Cedronella, Cestrum, Citrus,* Convolvulus, Dracocephalum, Eucalyptus, Gelsemium, Hypoestes, Jasminum,* Lavandula,* Leptospermum, Liatris, Lippia, Liquidambar, Melia, Melissa, Mentha, Monarda, Murraya, Myrtus, Nyctanthes, Ocimum, Origanum, Osmanthus, Pelargonium,* Pittosporum, Plumiera, Pogostemon, Polianthes, Prunus, Pycnanthemum, Reseda,* Rosa,* Rosmarinus, Santalum, Satureja, Styrax, Synoon, Syringa, Teucrium, Thymus, Tilia, Triphasia, Vahea, Viola,* Wistaria.

GENERA INDICATING—*continued.*

Silk-Plants—

Ailantus, Cajanus, Castanea, Cudrania, Dipsacus, Liquidambar, Maclura, Morus,* Quercus, Ricinus, Shorea, Symplocos, Terminalia, Trophis, Ulmus, Zizyphus, [not Boehmeria].

Starch-Plants—

Æsculus, Alstrœmeria, Artocarpus, Canna,* Caryota, Colocasia, Copernicia, Cycas, Dioscorea, Fagopyrum, Hordeum, Ipomoea, Levisia, Manihot, Maranta,* Musa, Oreodoxa, Oryza,* Secale, Solanum,* Tacca, Triticum,* Zea.*

Sugar-Plants—

Acer, Andropogon,* Beta,* Borassus, Caryota, Copernicia, Cucumis, Euchlæna, Phœnix, Saccharum,* Zea.

Tan-Plants—

Acacia,* Æsculus, Alnus, Albizzia, Angophora, Aspidosperma, Banksia, Butea, Cæsalpinia, Castanea, Cedrela, Coccoloba, Comptonia, Cytisus, Dacrydium, Duvaua, Elephanthorrhiza, Eucalyptus, Eugenia, Gordonia, Gunnera, Loxopterygium, Osiris, Pinus, Piptadenia, Populus, Prosopis, Prunus, Pterocarpus, Quercus,* Rhus,* Rumex, Salix, Terminalia.

Tea-Plants—

Achillea, Andropogon, Astartea, Camellia,* Catha, Ceanothus, Hydrangea, Ilex, Vaccinium.

Tide-Plants—

Ægiceras, Avicennia, Batis, Cyperus, Melaleuca, Myoporum, Salicornia, Spartina, Terminalia.

Timber-Plants—

1. TREES, CONIFEROUS—

a. Evergreen—

Araucaria,* Belis, Callitris, Cephalotaxus, Cryptomeria, Cupressus, Dacrydium, Dammara,* Fitzroya, Juniperus, Libocedrus, Nageia,* Phyllocladus, Pinus,* Saxono-Gothæa, Sciadopitys, Sequoia,* Taxus, Thuya, Torreya.

b. Deciduous—

Ginkgo, Glyptostrobus, Pinus, Taxodium.*

GENERA INDICATING—*continued.*

2. TREES, NOT CONIFEROUS—

a. Evergreen—

Acacia, Adenostemon, Albizzia, Angophora, Castanopsis, Casuarina, Cedrela,* Ceratopetalum, Cercocarpus, Chloroxylon, Corynocarpus, Dalbergia, Diospyros, Dysoxylon, Embothrium, Eucalyptus,* Eucryphia, Fagus,* Flindersia, Gmelina, Gourlea, Grevillea, Guayacum, Hardwickia, Harpullia, Hymenæa, Jacaranda, Knightia, Laurelia, Litsea, Maba, Machilus, Magnolia, Maytenus, Metrosideros, Myrtus, Ocotea, Owenia, Peltophorum, Persea, Peumus, Pistacia, Psychotria, Quercus,* Rhus, Royenia, Santalum, Shorea, Stylidium, Swietenia,* Syncarpia, Tristania, Umbellularia, Zizyphus.

b Deciduous—

Acer,* Æsculus, Ailantus, Alnus, Betula, Butea, Carpinus, Carya,* Castanea,* Catalpa, Celtis, Corylus, Curtisia, Diospyros, Engelhardtia, Excæcaria, Fagus,* Fraxinus,* Gleditschia, Gymnocladus, Holoptelea, Juglans* Liriodendron, Magnolia, Melia, Ostrya, Pircunia, Planera, Platanus, Populus, Pterocarpus, Pterocarya, Quercus,* Robinia, Salix,* Tectona, Tilia, Ulmus,* Xylia, Zelkova.

Tobacco-Plant—

Nicotiana.*

Water-Plants—

Acorus, Æschynomene, Aponogeton, Butomus, Cyperus, Euryale, Menyanthes, Nelumbo, Nuphar, Oryza, Poa, Richardia, Sagittaria, Trapa, Zizania.

Wicker-Plants—

Calamus, Cyperus, Parrotia, Salix,* (also genera mentioned under Bamboo-Plants).

Woodengravers'-Plants—

Aspidosperma, Buxus,* Camellia, Cratægus, Dacrydium, Diospyros, Eucalyptus, Gonioma, Ilex, Pittosporum, Prunus, Pyrus, Rhododendron, Royenia, Sambucus, Torreya.

SYSTEMATIC INDEX TO GENERA.

DICOTYLEDONEÆ.

Ranunculaceæ.
Aconitum.
Actæa.
Anemone.
Cimicifuga.
Helleborus.
Hydrastis.
Xanthorrhiza.

Nymphæaceæ.
Euryale.
Nelumbo.
Nuphar.

Piperaceæ.
Piper.

Canellaceæ.
Canella.

Magnoliaceæ.
Drimys.
Illicium.
Liriodendron.
Magnolia.
Michelia.

Calycantheæ.
Calycanthus.

Anonaceæ.
Anona.
Asimina.
Monodora.

Laurineæ.
Adenostemum.
Cinnamomum.
Laurus.
Lindera.
Litsea.
Machilus.
Persea.
Sassafras.
Umbellularia.

Monimieæ.
Laurelia.
Peumus.

Berberideæ.
Akebia.
Berberis.
Bongardia.
Decaisnea.
Holboellia.
Lardizabala.
Leontice.
Podophyllum.

Papaveraceæ.
Chelidonium.
Glaucium.
Papaver.
Sanguinaria.

Cruciferæ.
Barbarea.
Brassica.
Cakile.
Camelina.
Caulanthus.
Cochlearia.
Crambe.
Eruca.
Isatis.
Lepidium.
Physorrhynchos.
Pringlea.
Pugionium.
Raphanus.
Stenopetalum.

Capparideæ.
Capparis.

Violaceæ.
Hymenanthera.
Viola.

Moringaceæ.
Moringa.

Bixaceæ.
Aberia.
Bixa.
Doryalis.
Gynocardia.

Cistaceæ.
Cistus.

Resedaceæ.
Reseda.

Pittosporeæ.
Pittosporum.

Polygalaceæ.
Krameria.
Polygala.

Guttiferæ.
Garcinia.
Mammea.
Ochrocarpus.

Camelliaceæ.
Camellia.
Gordonia.
Schima.

Dipterocarpeæ.
Shorea.

Linaceæ.
Erythroxylon.
Linum.

Geraniaceæ.
Averrhoa.
Oxalis.
Pelargonium.
Tropæolum.

Malvaceæ.
Althæa.
Gossypium.
Hibiscus.
Lavatera.
Malachra.
Malva.
Urena.
Wissadula.

Sterculiaceæ.
Brachychiton.
Cola.
Sterculia.

Tiliaceæ.
Aristotelia.
Corchorus.
Tilia.

Euphorbiaceæ.
Aleurites.
Baloghia.
Buxus.
Croton.
Crozophora.
Excaecaria.
Hevea.
Joannesia.
Mallotus.
Manihot.
Phyllanthus.
Ricinus.
Stillingia.

SYSTEMATIC INDEX TO GENERA—*continued.*

Urticaceæ.
Artocarpus.
Boehmeria.
Broussonetia.
Cannabis.
Castillœa.
Celtis.
Cudrania.
Debregeasia.
Ficus.
Holoptelea.
Humulus.
Maclura.
Maoutia.
Morus.
Planera.
Pipturus.
Pouzolzia.
Streblus.
Touchardia.
Trophis.
Ulmus.
Villebrunia.
Zelkova.

Juglandeæ.
Carya.
Engelhardtia.
Juglans.
Pterocarya.

Amentaceæ.
Alnus.
Betula.
Carpinus.
Castanea.
Castanopsis.
Comptonia.
Corylus.
Fagus.
Myrica.
Ostrya.
Platanus.
Populus.
Quercus.
Salix.

Casuarineæ.
Casuarina.

Zygophylleæ.
Guajacum.

Rutaceæ.
Ægle.
Atalantia.
Barosma.
Boronia.
Calodendron.
Casimiroa.
Citrus.
Clausena.
Limonia.
Murraya.
Pilocarpus.
Ruta.
Triphasia.
Xanthoxylon.

Simarubeæ.
Ailantus.
Simaba.

Anacardiaceæ.
Corynocarpus.
Loxopterygium.
Mangifera.
Melanorrhœa.
Odina.
Pistacia.
Rhus.
Schinus.
Spondias.

Burseraceæ.
Amyris.
Balsamodendron.
Boswellia.
Bursera.

Meliaceæ.
Cedrela.
Chloroxylon.
Dysoxylon.
Flindersia.
Melia.
Owenia.
Synoon.
Swietenia.

Sapindaceæ.
Acer.
Æsculus.
Blighia.
Cupania.
Harpullia.
Melianthus.
Melicocca.
Nephelium.
Pappea.
Paulinia.

Celastrineæ.
Catha.
Euonymus.
Maytenus.

Datiscaceæ.
Datisca.

Tamariscineæ.
Tamarix.

Cacteæ.
Cereus.
Echinocactus.
Opuntia.
Peireskia.

Ficoideæ.
Mesembrianthemum.
Sesuvium.
Pharnaceum.
Tetragonia.

Caryophylleæ.
Saponaria.
Silene.
Spergula.

Portulaceæ.
Claytonia.
Lewisia.
Montia.
Portulacaria.
Talinum.

Amarantaceæ.
Amarantus.
Euxolus.

Salsolaceæ.
Agriophyllum.
Anabasis.
Atriplex.
Basella.
Beta.
Boussingaultia.
Chenopodium.
Eurotia.
Exomis.
Kochia.
Rhagodia.
Spinacia.
Theligonum.
Ullucus.

Polygonaceæ.
Calligonum.
Coccoloba.
Fagopyrum.
Polygonum.
Rheum.
Rumex.

SYSTEMATIC INDEX TO GENERA—*continued.*

Nyctagineæ.
Pisonia.

Phytolaccæ.
Pircunia.

Thymeleæ.
Aquilaria.
Dirca.
Thymelæa.

Rosaceæ.
Alchemilla.
Amelanchier.
Cercocarpus.
Cratægus.
Fragaria.
Geum.
Hagenia.
Parinarium.
Photinia.
Prunus.
Pyrus.
Quillaja.
Rosa.
Rubus.
Sanguisorba.

Leguminosæ.
Acacia.
Adesmia.
Æschynomene.
Albizzia.
Aloexylon.
Anthyllis.
Apios.
Arachis.
Astragalus.
Baptisia.
Butea.
Cæsalpinia.
Cajanus.
Canavalia.
Caragana.
Cassia.
Ceratonia.
Cercis.
Cicer.
Cladrastis.
Crotalaria.
Cyamops s.
Cytisus.
Dalbergia.
Desmodium.
Dolichos.
Elephantorrhiza.
Ervum.
Flemingia.
Galega.
Genista.
Gleditschia.
Glycine.
Glycyrrhiza.
Gourliea.
Gymnocladus.
Hæmatoxylon.
Hardwickia.
Hedysarum.
Hippocrepis.
Hymenæa.
Indigofera.
Jacksonia.
Lathyrus.
Lespedeza.
Liparia.
Lotus.
Lupinus.
Medicago.
Melilotus.
Mimosa.
Mucuna.
Onobrychis.
Ornithopus.
Oxytropis.
Pachyrrhizus.
Parkinsonia.
Peltophorum.
Periandra.
Phaseolus.
Piptadenia.
Piscidia.
Pisum.
Prosopis.
Psophocarpus.
Psoralea.
Pterocarpus.
Pueraria.
Rafnia.
Robinia.
Sesbania.
Sophora.
Spartium.
Stylosanthes.
Tamarindus.
Trifolium.
Trigonella.
Ulex.
Vicia.
Vigna.
Voandzeia.
Wistaria.
Xylia.

Saxifrageæ.
Ceratopetalum.
Eucryphia.
Hydrangea.
Ribes.

Aristolochieæ.
Aristolochia.

Hamamelideæ.
Hamamelis.
Liquidambar.
Parrotia.

Myrtaceæ.
Agonis.
Angophora.
Astartea.
Backhousia.
Bertholletia.
Calyptranthes.
Eucalyptus.
Eugenia.
Kunzea.
Leptospermum.
Marliera.
Melaleuca.
Metrosideros.
Myrtus.
Pimenta.
Psidium.
Syncarpia.
Tristania.

Combretaceæ.
Combretum.
Terminalia.

Onagreæ.
Fuchsia.
Trapa.

Lythraceæ.
Lawsonia.
Punica.

Passifloreæ
Carica.
Passiflora.

Cucurbitaceæ.
Acanthosicyos.
Benincasa.
Corynosicyos.
Cucumis.

SYSTEMATIC INDEX TO GENERA—*continued.*

Cucurbita.
Ecballion.
Sechium.
Telfairia.

Olacinæ.

Ximenia.

Santalaceæ.

Cervantesia.
Osyris.
Pyrularia.
Santalum.

Proteaceæ.

Brabejum.
Conospermum.
Embothrium.
Grevillea.
Guevina.
Knightia.
Leucadendron.
Macadamia.
Protea.

Elæagneæ.

Elæagnus.
Shepherdia.

Cornaceæ.

Cornus.
Curtisia.
Nyssa.
Stylidium.

Rhamnaceæ.

Ceanothus.
Colletia.
Condalia.
Hovenia.
Paliurus.
Rhamnus.
Scutia.
Zizyphus.

Viniferæ.

Vitis.

Umbelliferæ.

[Including Araliaceæ.]
Anthriscus.
Apium.
Arracacha.
Aralia.
Archangelica.
Carum.
Chærophyllum.
Conium.
Conopodium.
Coriandrum.
Crithmum.
Cuminum.
Cymopterus.
Daucus.
Diposis.
Dorema.
Eryngium.
Fatsia.
Ferula.
Fœniculum.
Hedera.
Heracleum.
Laserpitium.
Myrrhis.
Œnanthe.
Panax.
Peucedanum.
Pimpinella.
Prangos.
Psammogeton.
Scandix.
Selinum.
Seseli.
Sison.
Smyrnium.
Stilbocarpa.
Thapsia.
Tinguarra

Rubiaceæ.

Alibertia.
Asperula.
Bouvardia.
Cephaelis.
Cephalanthus.
Cinchona.
Coffea.
Plectronia.
Psychotria.
Richardsonia.
Rubia.
Vangueria.

Caprifoliaceæ.

Sambucus.
Viburnum.

Valerianeæ.

Nardostachys.
Valeriana.
Valerianella.

Dipsaceæ.

Dipsacus.

Compositæ.

Achillea.
Anacyclus.
Anthemis.
Arnica.
Artemisia.
Baccharis.
Carthamus.
Chrysanthemum.
Chrysopsis.
Cichorium.
Crepis.
Cynara.
Echinops.
Eupatorium.
Garuleum.
Grindelia.
Guizotia.
Helianthus.
Helichrysum.
Heterothalamus.
Hypochœris.
Inula.
Launæa.
Lactuca.
Leyssera.
Liatris.
Matricaria.
Microseris.
Mutisia.
Osmitopsis.
Parthenium.
Pentzia.
Phymaspermum.
Podachænium.
Rhaponticum.
Santolina.
Saussurea.
Scorzonera.
Schkuhria.
Scolymus.
Spilanthes.
Tagetes.
Tanacetum.
Taraxacum.
Tarchonanthus.
Tragopogon.
Waitzia.

Campanulaceæ.

Campanula.

SYSTEMATIC INDEX TO GENERA—*continued.*

Ericaceæ.
Arbutus.
Arctostaphylos.
Gaultiera.
Gaylussacia.
Rhododendron.
Vaccinium.

Styraceæ.
Styrax.
Symplocos.

Aquifoliaceæ.
Ilex.

Ebenaceæ.
Diospyros.
Euclea.
Maba.
Royenia.

Sapotaceæ.
Achras.
Argania.
Chrysophyllum.
Dichopsis.
Illippe.
Imbricaria.
Mimusops.
Niemeyera.
Palaquium.
Payenia.
Sideroxylon.

Myrsinaceæ.
Ægiceras.

Jasmineæ.
Azima.
Fraxinus.
Jasminum.
Ligustrum.
Nyctanthes.
Olea.
Osmanthus.
Syringa.

Apocyneæ.
Alstonia.
Apocynum.
Aspidosperma.
Carissa.
Gonioma.
Hancornia.
Plumiera.
Strophanthus.
Vahea.

Asclepiadeæ.
Araujia.

Loganiaceæ.
Buddlea.
Gelsemium.
Spigelia.

Plantagineæ.
Plantago.

Gentianeæ.
Gentiana.
Menyanthes.
Sabbatia.
Sebæa.
Swertia.

Convolvulaceæ.
Convolvulus.
Ipomœa.

Solaneæ.
Atropa.
Bassovia.
Capsicum.
Cestrum.
Duboisia.
Hyoscyamus.
Lycium.
Nicotiana.
Physalis.
Salpichroma.
Solanum.
Withania.

Scrophularineæ.
Chelone.
Digitalis.
Lyperia.
Paulownia.
Verbascum.
Veronica.

Acanthaceæ.
Hypoestes.
Justicia.

Bignoniaceæ.
Catalpa.
Jacaranda.

Pedalineæ.
Sesamum.

Asperifoliæ.
Alkanna.
Borrago.
Cerinthe.
Echium.
Heliotropium.
Lithospermum.
Maharanga.
Onosma.
Symphytum.
Trichodesma.

Labiatæ.
Audibertia.
Calamintha.
Cedronella.
Coleus.
Collinsonia.
Dracocephalum.
Hedeoma.
Hyssopus.
Lasiocorys.
Lavandula.
Leonotis.
Marrubium.
Melissa.
Mentha.
Meriandra.
Micromeria.
Monarda.
Nepeta.
Ocimum.
Origanum.
Pogostemon.
Perilla.
Plectranthus.
Prostanthera.
Pycnanthemum.
Rosmarinus.
Salvia.
Satureja
Stachys.
Teucrium.
Thymus.
Trichostema.

Verbenaceæ.
Avicennia.
Gmelina.
Lantana.
Lippia.
Priva.
Tectona.
Vitex.

SYSTEMATIC INDEX TO GENERA—*continued.*

Myoporinæ.
Eremophila.
Myoporum.

Selaginæ.
Selago.

Coniferæ.
Araucaria.
Belis.
Callitris.
Cephalotaxus.
Cryptomeria.
Cupressus.
Dacrydium.
Dammara.
Fitzroya.
Ginkgo.
Glyptostrobus.
Juniperus.
Libocedrus.
Nageia.
Phyllocladus.
Pinus.
Saxono-Gothæa.
Sciadopitys.
Sequoia.
Taxodium.
Taxus.
Thuya.
Torreya.

Cycadeæ.
Cycas.
Encephalartos.

MONOCOTYLEDONEÆ.

Musaceæ.
Musa.

Scitamineæ.
Canna.
Curcuma.
Maranta.
Zingiber.

Bromeliaceæ.
Ananas.
Tillandsia.

Taccaceæ.
Tacca.

Dioscorideæ.
Dioscorea.

Irideæ.
Crocus.
Gladiolus.
Iris.

Amaryllideæ.
Agave.
Aletris.
Alstrœmeria.
Beschorneria.
Fourcroya.
Polianthes.

Liliaceæ.
Aloe.
Allium.
Asparagus.
Chlorogalum.
Colchicum.
Convallaria.
Cordyline.
Dracæna.
Eremurus.
Eustrephus.
Geitonoplesium.
Lapageria.
Ophipogon.
Phormium.
Ruscus.
Sanseviera.
Schœnocaulon.
Scilla.
Smilax.
Trillium.
Tulipa.
Urginia.
Uvularia.
Veratrum.
Xanthorrhœa.
Yucca.

Alismaceæ.
Aponogeton.
Butomus.
Sagittaria.

Fluviales.
Triglochin.

Aroideæ.
Acorus.
Amorphophallus.
Colocasia.
Monstera.
Richardia.
Xanthosma.

Typhaceæ.
Typha.

Cyclanthaceæ.
Carludovica.

Pandanaceæ.
Pandanus.

Palmaceæ.
Acanthophœnix.
Acrocomia.
Arenga.
Bactris.
Bacularia.
Borassus.
Brahea.
Calamus.
Calyptronoma.
Caryota.
Ceroxylon.
Chamædora.
Chamærops.
Cocos.
Copernicia.
Diplothemium.
Dypsis.
Elæis.
Euterpe.
Geonoma.
Hyphæne.
Jubæa.
Kentia.
Livistona.
Mauritia.
Oncosperma.
Oreodoxa.
Phœnix.
Plectocomia.
Prestoa.
Pritchardia.
Pseudophœnix.
Ptychosperma.
Rhapis
Rhapidophyllum.
Sabal.
Serenoa.
Thrinax.
Trithrinax.
Wallichia.
Washingtonia.

SYSTEMATIC INDEX TO GENERA—*continued.*

Wettinia.
Zalacca.

Restiaceæ.
Elegia.

Cyperaceæ.
Carex.
Cyperus.
Heleocharis.
Lepidosperma.
Lepironia.
Remirea.
Scirpus.

Gramineæ.
Agrostis.
Aira.
Alopecurus.
Andropogon.
Anthistiria.
Anthoxanthum.
Aristida.
Arundinaria.
Arundinella.
Arundo.
Astrebla.
Avena.
Bambusa.
Beesha.
Bouteloua.
Briza.
Bromus.
Buchloa.
Calamagrostis.
Chionachne.
Chloris.
Chusquea.
Cinna.
Coix.
Cynodon.
Cynosurus.
Dactylis.
Danthonia.
Dendrocalamus.
Dinochloa.
Ectrosia.
Ehrharta.
Eleusine.
Elionurus.
Elymus.
Epicampes.
Erianthus.
Eriochloa.
Euchlæna.
Festuca.
Gigantochloa.
Guadua.
Hemarthria.
Hierochloa.
Holcus.
Hordeum.
Imperata.
Kœleria.
Leersia.
Lolium.
Lygeum.
Melica.
Melocalamus.
Melocanna.
Milium.
Muehlenbergia.
Nastus.
Neurachne.
Oryza.
Oryzopsis.
Oxytenanthera.
Panicum.
Pappophorum.
Paspalum.
Pennisetum.
Phalaris.
Phleum.
Phyllostachys.
Poa.
Psamma.
Rottboellia.
Saccharum.
Schizostachyum.
Secale.
Sesleria.
Spartina.
Spinifex.
Sporobolus.
Stenotaphrum.
Stipa.
Thamnocalamus.
Teinostachyum.
Thouarea.
Triodia.
Tripsacum.
Trisetum.
Triticum.
Uniola.
Zea.
Zizania.
Zoysia.

ACOTYLEDONEÆ.

Filices.
Alsophila.
Cyathea.
Dicksonia.
Lycopodium.
Todea.

Lichenes.
Cetraria.
Roccella.

Fungaceæ.
Agaricus.
Boletus.
Cantharellus.
Clavaria.
Coprinus.
Cortinarius.
Exidia.
Fistulina.
Helvella.
Hydnum.
Lycoperdon.
Morchella.
Pachyma.
Peziza
Polygaster.
Polyporus.
Rhizopogon.
Russula.
Terfezia.
Tremella.
Tuber.

Algæ.
Chondrus.
Gelidium.
Gracilaria.
Porphyra.

GENERIC SYNONYMS, REFERRED RESPECTIVELY T(THE ADOPTED GENERA.

(In many cases the name of the genus changeable only for some of its species.)

Abbevillea ... Psidium.
Abies ... ... Pinus.
Acacia ... ... Albizzia, Piptadenia.
Achyrophorus ... Hypochæris.
Adenachæna ... Phymaspermum.
Aeluropus ... Dactylis.
Agapetes ... ... Vaccinium.
Agathis ... ... Dammara.
Agropyrum ... Triticum.
Alocasia ... ... Colocasia.
Amarantus . . Euxolus.
Amphibromus ... Danthonia.
Amygdalus ... Prunus.
Anda ... ... Joannesia.
Anesorrhizza ... Selinum.
Anethum ... Carum, Peucedanum.
Apium ... ... Carum.
Aralia ... ... Fatsia.
Areca ... ... Bacularia, Ptychosperma.
Armeniaca ... Prunus.
Arrhenatherum ... Avena.
Asa-Graya ... Schoenocaulon.
Astragalus ... Oxytropis.
Aucklandia ... Saussurea.
Azadirachta ... Melia.
Balsamocarpon ... Cæsalpinia.
Bambusa ... ... Gigantochloa, Guadua, Phyllostachys.
Bassia ... ... Illippe.
Batatas ... ... Ipomœa.
Beesha ... ... Melocanna.
Biotia ... ... Thuya.
Blighia ... ... Cupania.
Blitum ... ... Chenopodium.
Boaria ... ... Maytenus.
Brahea ... ... Washingtonia.
Brayera ... ... Hagenia.
Bunium ... ... Carum.
Cæsalpinia ... Peltophorum.
Calamagrostis ... Psamma.
Calandrinia ... Claytonia.
Camassia ... ... Scilla.
Campomanesia ... Psidium.
Caryotaxus ... Torreya.
Catabrosa ... Poa.
Caulophyllum ... Leontice.
Cedrus ... ... Pinus.
Cephalandra ... Coccinia.
Ceratostemma ... Vaccinium.
Chamæcyparis ... Cupressus, Thuya.
Chamærops ... Rhapidophyllum.
Cibotium ... ... Dicksonia.
Cicca ... ... Phyllanthus.
Citrullus ... ... Cucumis.
Cladosicyos ... Corynosicyos.
Codiæum ... ... Baloghia.
Cookia ... ... Clausena.
Commiphora ... Balsamodendron
Cotinus ... ... Rhus.
Cunninghamia ... Belis.
Cydonia ... ... Pyrus.
Dactylis ... ... Poa.
Danthonia ... Astrebla.
Dichopsis ... Palaquium.
Diosma ... ... Barosma.
Dolichos ... ... Vigna, Pachyrrhizus.
Eragrostis ... Poa.
Eriobotrya ... Photinia.
Ervum ... ... Vicia.
Euryangium ... Ferula.
Fabricia ... ... Leptospermum.
Fagotriticum ... Fagopyrum.
Ferdinanda ... Podachænium.
Festuca ... ... Distichlis.
Flueggea ... Ophiopogon.
Frenela ... ... Callitris.
Glechoma ... Nepeta.
Glyceria ... ... Poa.
Grumilia ... ... Psychotria.
Guilandina ... Cæsalpinia.
Guilielma ... Bactris.
Gynerium ... Arundo.
Haplotaxis ... Saussurea.
Harina ... ... Wallichia.
Hedyscepe ... Kentia.
Hellenia ... Alpinia.
Hirneola ... Exidia.
Hordeum ... Elymus.
Howea ... ... Kentia.
Hydrochloa ... Zizania.
Hydropyrum ... Zizania.
Hyospathe ... Prestoa.
Imperatoria ... Peucedanum.
Isachne ... ... Panicum.
Isonandra ... Palaquium.

GENERIC SYNONYMS—*continued.*

Juania ...	... Ceroxylon.
Kentia ...	... Clinostigma.
Landolphia	... Vahea.
Larix ...	... Pinus.
Latnyrus ...	... Ervum.
Lens ...	... Ervum.
Lithræa ...	.. Rhus.
Lucuma ...	... Niemeyera.
Lycopersicum	... Salanum.
Lysiloma	... Albizzia.
Macranthus	... Mucuna.
Machrochloa	... Stipa.
Macrozamia	... Encephalartos.
Maharanga	... Onosma.
Malabaila	... Peucedanum.
Marlea ...	... Stylidium.
Melloca ...	... Ullucus.
Mespilus ...	... Cratægus, Pyrus.
Metrosideros	... Syncarpia.
Microlæna	... Ehrharta.
Monizia ...	... Thapsia.
Myrcianthes	... Myrtus.
Nannorrhops	... Chamærops.
Nasturtium	... Cochlearia.
Negundo ...	... Acer.
Nelumbium	... Nelumbo.
Nengella ...	... Kentia.
Ophelia ...	... Swertia.
Oplismenus	... Panicum.
Oreodaphne	... Ocotea, Umbellularia.
Orobus ...	... Lathyrus.
Osmunda ...	... Todea.
Oxycoccus	... Vaccinium.
Oxytenanthera	... Gigantochloa.
Panax ...	... Aralia.
Panicum ...	... Pennisetum.
Paspalum	... Panicum.
Passerina...	... Thymelæa.
Pastinaca	... Peucedanum.
Penicillaria	... Pennisetum.
Phytolacca	... Pircunia.
Picea ...	... Pinus.
Piptatherum	... Milium.
Piptochætium	... Oryzopsis.
Pithecolobium	... Albizzia.
Planera ...	... Zelkova.
Poa ...	... Festuca.
Podocarpus	... Nageia.
Poinciana	... Cæsalpinia.
Pollichia	... Trichodesma.
Pollinia ...	... Andropogon.
Poterium	... Sanguisorba.
Prinos ...	... Ilex.
Pritchardia	... Washingtonia.
Prumnopithys	... Nageia.
Pyrethrum	... Chrysanthemum, Tanacetum.
Quadria ...	... Guevina.
Reana ...	... Euchlæna.
Retinospora	... Cupressus.
Rhopalostylis	... Kentia.
Rottlera ...	... Mallotus.
Rubachia	... Marliera.
Sabadilla	... Schœnocaulon.
Sabal ...	... Serenoa.
Salisburia	... Ginkgo.
Sapota ...	... Achras.
Satureja...	... Thymus.
Scilla ...	... Urginea
Scorodosma	... Ferula.
Seaforthia	... Ptychosperma.
Setaria ...	... Panicum.
Sinapis ...	... Brassica.
Siphonia	... Hevea
Sium ...	... Pimpinella.
Slakea ...	... Decaisnea.
Soja ...	... Glycine.
Sorghum...	... Andropogon.
Spartium	... Cytisus.
Sterculia	... Cola.
Stillingia	... Excœcaria.
Taxodium	... Glyptostrobus, Sequoia.
Tetranthera	... Umbellularia.
Thamnocalamus..	Arundinaria.
Thea ...	... Camellia.
Themeda	... Anthistiria.
Thibaudia	... Vaccinium.
Thuyopsis	... Thuya.
Trachycarpus	... Chamærops.
Tricholæna	... Panicum.
Tricuspis	... Festuca.
Trisetum	... Avena.
Ulmus ...	... Holoptelea.
Uralepis ...	... Festuca.
Wellingtonia	... Sequoia.
Widdringtonia ...	Callitris.
Witheringia	... Bassowia.
Xanthochymus ...	Garcinia.

GEOGRAPHIC INDEX.

NORTHERN AND MIDDLE EUROPE.

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laciniatum, R. villosum, Ricinus communis,* Rosa Indica, R. moschata, R. sempervirens, Rubia cordifolia, Rubus acuminatus, R. biflorus, R. ellipticus,* R. lasiocarpus, R. Moluccanus, R. nutans, R. rugosus,* R. tiliaceus, Saccharum officinarum,* S. spontaneum, S. violaceum, Salix Daviesii, S. tetrasperma, Sanseviera Zeylanica, Santalum album, Schima Wallichii, Schizostachyum elegantissimum, S. Blumei, S. brachycladum, S. Hasskarlianum, S. irratum, S. Zollingeri, Scutia Indica, Sesamum Indicum,* Sesbania aculeata, S. Ægyptiaca, S. cannabina, S. grandiflora, Sesuvium Portulacastrum, Shorea robusta, S. Talura, Sideroxylon attenuatum, Solanum album, S. ferox, S. Guineense, S. insanum, S. longum, S. Melongena, S. pseudosaponaceum, S. undatum, Spinifex squarrosus, Spondias mangifera, Stenotaphrum dimidiatum, Sterculia monosperma, S. urceolata, S. urens, Streblus asper, Swertia Chirata, S. elegans, Symplocos ramosissima, Syringa vulgaris, Tamarindus Indica, Tamarix articulata, T. dioica, T. Gallica,* T. orientalis, Tectona grandis, T. Hamiltoniana, Teinostachyum attenuatum, T. Griffithii (under Schizostachyum), Terminalia Catappa, T. Chebula, T. parviflora, T. tomentosa, Tetranthera calophylla, T. laurifolia, Thouarea sarmentosa, Trapa bispinosa,* T. Cochinchinensis, T. incisa, T. quadrispinosa, Trichodesma Zeylanicum, Triphasia Aurantiola, Ulmus Wallichiana, Urena lobata, Vaccinium Leschenaulti, Vigna Sinensis,* Villebrunea frutescens, V. integrifolia, Vitex trifolia, Vitis auriculata, V. Blumeana, V. elongata, V. imperialis, V. Indica, V. Labrusca, V. lævigata, V. mutabilis, V. quadrangularis, V. thyrsiflora, V. vulpina,* Wallichia caryotoides, W. densiflora, Withania coagulans, W. somnifera, Ximenia Americana, Xylia dolabriformis, Zalacca secunda, Zingiber officinale, Zizyphus Jujuba, Z. rugosa, Zoysia pungens.

WESTERN SOUTH-AMERICA.

Acacia Cavenia, A. macracantha, Achras Balata, Adenostemum nitidum, Adesmia balsamica, Aira antarctica, A. Magellanica, Alchemilla pinnata, Alnus acuminata, Alstrœmeria pallida, Ananas sativa,* Andropogon argenteus, Anona Cherimolia, Apium Chilense, A. prostratum, Arachis hypogæa,* Araucaria imbricata,* Aristotelia Macqui, Arracacha xanthorriza, Bassovia solanacea, Berberis buxifolia, B. Darwinii, Boussingaultia baselloides, Buddlea globosa, Cæsalpinia brevifolia, C. tinctoria, Canna edulis,* Carex pumila, Carica Candamarcensis, C. Papaya, Cedrela Bogotensis, Cereus Atakamensis, C. Quixo, Ceroxylon andicola,* C. Australe, C. pithyrophyllum (under Wettinia), Cervantesia tomentosa, Chenopodium Quinoa, Chusquea Culeou, C. Dombeyana, C. montana, C. Quila, C. tenuiflora (under Schizostachyum), Cinchona Calisaya,* C. cordifolia,* C. micrantha, C. nitida, C. officinalis,* C. succirubra,* Condalia microphylla, Cucurbita maxima, C. moschata, Dactylis cæspitosa, Datura arborea, Desmodium uncinatum, Dioscorea piperifolia, Diplothemium Porallyi (under Wettinia), Diposis Bulbocastanum, Drimys Winteri, Elymus condensatus, Embothrium coccineum, E. emarginatum, E. lanceola-

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tum, Erythroxylon Coca,* Eucryphia cordifolia, Eugenia Hallii, Euterpe andicola, E. Hænkena, E. longivaginata (under Wettinia), Fabiana imbricata, Fagus Dombeyi, F. obliqua, F. procera, F. antarctica, F. betuloides, Festuca Coiron, F. Magellanica, Fitzroya Patagonica,* Fragaria Chiloensis,* Fuchsia racemosa, Geonoma densa (under Wettinia), Gossypium religiosum,* Guadua angustifolia,* G. latifolia,* Guevina Avellana,* Gunnera Chilensis, Helianthus annuus,* Heliotropium Peruvianum, Hypochœris apargioides, H. Scorzoneræ, Ipomœa Batatas,* I. pes caprae, Jubæa spectabilis, Krameria triandra, Lapageria rosea, Lardizabala biternata, Laurelia aromatica, L. serrata, Libocedrus Chilensis, L. tetragona, Lippia citriodora, Manihot Aipi,* Mauritia flexuosa, Maytenus Boaria, Melicocca bijuga, Mesembrianthemum æquilaterale, Morus celtidifolia, M. insignis, Mutisia vicifolia, Myrtus Luma, M. Meli, M. nummularia, M. Ugni,* Nageia andina, N. Chilina, N. nubigena, Opuntia vulgaris, Oreodoxa frigida (under Wettinia), Oryza latifolia, Oryzopsis cuspidata, O. panicoides, Oxalis crassicaulis, O. crenata, O. enneaphylla, O. succulenta, O. tuberosa, Pachyrrhizus angulatus, Panicum pilosum, Paspalum ciliatum, P. dilatatum, Passiflora alata, P. tiliifolia, P. ligularis, P. macrocarpa, Persea gratissima, Peumus Boldus, Phaseolus vulgaris,* Physalis Peruviana*, Phytelephas æquatorialis (under Wettinia), Piptadenia rigida, Prosopis horrida, P. juliflora, P. Siliquastrum, Priva lævis, Quilaja saponaria, Rhus caustica, Rubus geoides, R. glaucus, Salix Humboldtiana, Saxono-Gothæa conspicua, Schkuhria abrotanoides, Schinus Molle, Scirpus nodosus, Sesuvium Portulacastrum, Simaba Cedron, Smilax officinalis, Solanum Gilo, S. Maglia, S. Guineense, S. Lycopersicum,* S. muricatum, S. Quitoense, S. tuberosum,* S. torvum, Sophora tetraptera, Spilanthes oleracea, Stipa Jarava, S. setigera, Tagetes glanduligera, Tetragonia expansa, Tillandsia usneoides, Trithrinax campestris, Tropæolum majus, T. minus, T. sessilifolium, T. tuberosum, Ullucus tuberosus, Vaccinium alatum, V. bicolor, V. grandiflorum, V. melliflorum, Wettinia angusta, W. Maynensis, Witheringia solanacea, Zea Mays,* Zizyphus Joazeiro, Z. Mistal.

WESTERN NORTH-AMERICA.

Acacia Greggii, Acer circinnatum, A. macrophyllum, Æsculus Californica, Amelanchier alnifolia, Arbutus Menziesii, Audibertia polystachya, Baccharis consanguinea, B. pilularis, Baptisia tinctoria, Barbarea vulgaris, Beschorneria yuccoides, Bouteloua polystachya, Carica Papaya, Carum Gairdneri, Castaneopsis chrysophylla, Caulanthus procerus, Ceanothus prostratus, C. rigidus, C. thyrsiflorus, Cercocarpus ledifolius, C. parvifolius, Cereus Engelmanni, C. giganteus, C. Pringlei, C. Thurberi, Chamædora elatior, Chlorogalum pomeridianum, Claytonia perfoliata, C. tuberosa, Cornus Nuttallii, Cucurbita moschata,* Cupressus fragrans, C. Guadaloupensis, C. Lawsoniana, C. macrocarpa,* C. Nutkaensis, Cymopterus glomeratus, Fragaria Californica, Fraxinus Oregana, Gaultiera Myrsinites, Geum urbanum, Juglans

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rupestris, Juniperus occidentalis, Libocedrus decurrens, Lupinus arboreus,* L. Douglasii, Micromeria Douglasii, Myrica Californica, Myrrhis occidentalis, Nicotiana multivalvis, Nuphar multisepalum, Nyssa aquatica, Parkinsonia aculeata, P. microphylla, Pinus albicaulis, P. amabilis, P. Arizonica, P. bracteata, P. Chihua-huana, P. concolor, P. contorta, P. Coulteri,* P. Douglassii,* P. edulis,* P. flexilis, P. grandis, P. Hookeriana, P. insignis,* P. Jeffreyi, P. Lambertiana,* P. Menziesii, P. Mertensiana, P. monophylla, P. monticola, P. muricata, Pinus latifolia, P. nobilis, P. Nuttallii, P. Pattoniana, P. ponderosa,* P. reflexa, P. resinosa, P. Sabiniana,* P. Sitkensis,* P. Torreyana, P. Williamsonii, Platanus racemosa, Populus Fremontii, P. tremuloides, P. trichocarpa, Pritchardia filamentosa, Prosopis pubescens, Prunus demissa, P. ilicifolia, P. subcordata, Pyrus rivularis, Quercus agrifolia, Q. chrysolepis,* Q. densiflora, Q. Douglasii, Q. Garryana, Q. lobata, Q. undulata, Rhamnus Californica, R. crocea, Ribes aureum, R. divaricatum, R. niveum, R. rubrum, R. tenuiflorum, R. villosum, Rubus leucodermis, R. macropetalus, R. ursinus, Sagittaria variabilis, Salix longifolia, Schinus Molle, Scilla esculenta, Sequoia sempervirens,* S. Wellingtonia,* Solanum Fendleri, S. tuberosum,* Stipa setigera, Tetranthera Californica, Torreya Californica, Trichostema lanatum, Umbellularia Californica, Vaccinium humifusum, V. ovalifolium, V. ovatum, Valeriana edulis, Vicia gigantea, Vitis Arizonica, V. Californica, Washingtonia filifera, Yucca angustifolia, Y. baccata, Y. brevifolia, Y. Sitchensis, Y. Treculiana.

EASTERN NORTH-AMERICA.

Acacia Wrightii, Acer dasycarpum, A. Negundo, A. rubrum, A. saccharinum,* Achillea Millefolium, Achras Sapota, Acorus Calamus, Acrocomia Mexicana, Actæa alba, A. spicata, Æsculus lutea, Agave Americana, A. heteracantha, A. Mexicana, A. vivipara, Agrostis palustris, A. rubra, A. scabra, A. vulgaris, Alchemilla alpina, A. vulgaris, Aletris farinosa, Allium Canadense, Allium gracile, A. striatum, A. Schœnoprasum, Alnus acuminata, Amelanchier Botryapium, Andropogon avenaceus, A. furcatus, A. nutans, A. scoparius, Apios tuberosa, Apocynum cannabinum, Arctostaphylos uva ursi, Aristolochia anguicida, A. ovalifolia, A. serpentaria, Arundinaria macrosperma, A. tecta, Asimina triloba, Astragalus hypoglottis, Barbarea vulgaris, Betula lenta, B. lutea, B. nigra, B. papyracea, Bouteloua barbata, Bouvardia longiflora, Brahea dulcis, B. edulis, Bromus ciliatus, B. marginatus, Buchloa dactyloides, Bursera elemifera, Cæsalpinia Bonduc, Cakile maritima, Calamagrostis Canadensis, C. longifolia, Canella alba, Canna flaccida, Carya alba,* C. amara, C. glabra,* C. microcarpa, C. oliviformis,* C. sulcata,* C. tomentosa,* Carpinus Americana, Cassia Marylandica, Catalpa bignonioides, C. speciosa, Cedronella cordata, Celtis occidentalis, Cephalanthus occidentalis, Cetraria Islandica, Chamædora concolor, Chelone glabra, Chondrus crispus, Chrysopsis graminifolia, Cimicifuga racemosa, Cinna arundinacea, Cladrastis tinctoria, Cochlearia officinalis, Collinsonia Canadensis,

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Comptonia asplenifolia, Cornus florida, Corylus Americana, C. rostrata, Cratægus æstivalis, C. apiifolia, C. coccinea, C. cordata, C. Crus Galli, C. Mexicana, C. parvifolia, C. tomentosa, Cucurbita Pepo, Cupressus Benthami, C. Lindleyi, C. thurifera, C. thuyoides, Desmodium acuminatum, D. Canadense, Diospyrus Virginiana,* Dirca palustris, Echinocactus Fendleri, Elymus mollis, E. Virginicus, Epicampes macroura, Euonymus atropurpureus, Eupatorium purpureum, Fagus ferruginea, Festuca flava, F. purpurea, Fragaria Chiloensis,* F. grandiflora,* F. Illinoensis, F. vesca,* F. Virginiana, Fraxinus Americana,* F. nigra, F. platycarpa, F. pubescens, F. quadrangulata,* F. viridis, Gaultieria Shallon, Gaylussacia frondosa,* G. resinosa, Gelsemium nitidum, Geum urbanum, Gleditschia monosperma, G. triacanthos, Gordonia lasianthos, Grindelia squarrosa, Gymnocladus Canadensis, Hamamelis Virginica, Hedeoma pulegioides, Hordeum nodosum, H. secalinum, Humulus Lupulus,* Hydrastis Canadensis, Ilex Cassine, I. verticillata, Indigofera Anil,* Ipomœa purga, I. simulans, Juglans cinerea,* J. nigra,* Juniperus flaccida, J. Mexicana, J. Virginiana,* Leontice thalictroides, Levisia rediviva, Liatris odoratissima, Lindera Benzoin, Liquidambar styraciflua, Liriodendron tulipifera, Lithospermum canescens, L. hirtum, L. longiflorum, Lycopodium dendroideum, L. lucidulum, Maclura aurantiaca,* Magnolia acuminata, M. cordata, M. Fraseri, M. grandiflora, M. macrophylla, M. umbrella, Melica mutica, Menyanthes trifoliata, Milium effusum, Mimusops Sieberi, Monarda didyma, M. fistulosa, M. punctata, Montia fontana, Morchella conica, M. esculenta, Morus rubra,* Muehlenbergia diffusa, M. Mexicana, Myrica cerifera, Nelumbo lutea,* Nicotiana quadrivalvis, N. repanda, N. rustica, N. Tabacum,* Nyssa aquatica, N. multiflora, N. uniflora, Opuntia coccinellifera, O. Ficus Indica, O. Hernandezii, O. Missouriensis, O. Rafinesquii, O. spinosissima, O. Tuna, O. vulgaris, Oryza latifolia, O. perennis, Ostrya Virginica, Oxalis Deppei, O. esculenta, O. tetraphylla, O. violacea, Pachyma Cocos, Panicum amarum, P. Myurus, P. obtusum,* P. ovatum, P. proliferum,* P. striatum, P. Texanum, P. virgatum, Parkinsonia aculeata, Parthenium integrifolium, Passiflora incarnata, P. lutea, P. suberosa, Paspalum læve, P. lentiginosum, P. platycaule, P. undulatum, Peireskia aculeata, P. Bleo, P. portulacifolia, Phaseolus perennis, Physalis angulata, P. pubescens, Pinus alba, P. aristata, P. Australis,* P. Ayacahuite, P. Bahamensis, P. Balfouriana, P. balsamea, P. Canadensis,* P. cembroides,* P. Cubensis,* P. Fraseri, P. glabra, P. Hartwegii, P. Hudsonica, P. inops, P. leiophylla, P. mitis,* P. Montezumæ, P. nigra, P. patula, P. pendula, P. Pinceana, P. Pseudostrobus, P. pungens, P. religiosa, P. rigida,* P. rubra, P. serotina, P. Strobus,* P. Tæda, P. tenuifolia, P. Teocote, P. Torreyana, Pisonia aculeata, Planera aquatica, Platanus occidentalis, Poa airoides, P. alpina, P. aquatica, P. arachnifera,* P. Canadensis, P. distans, P. fertilis, P. fluitans, P. maritima, P. nemoralis, P. nervata, P. palustris, P. pectinacea, Podophyllum peltatum, Polianthes tuberosa, Polygala

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CENTRAL AMERICA.

Acacia macracantha, Achras Sapota, Acrocomia Mexicana, Agave

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latisiliqua, A. Saman,* Aleurites triloba, Alnus acuminata, Amarantus paniculatus, Andropogon avenaceus, Anona muricata, A. reticulata, A. sericea, A. squamosa, Arracacha xanthorrhiza, Arthrostylidium excelsum, A. longiflorum, A. racemiferum (under Schizostachyum), Arundinaria acuminata, Aulonemia Quexo (under Schizostachyum); Averrhoa Bilimbi, A. Carambula, Bactris Gasipæs, Batis maritima, Beschorneria yuccoides, Bixa Orellana, Brahea dulcis, Bursera elemifera, Buxus acuminata, B. citrifolia, B. Cubana, B. glomerata, B. gonoclada, B. lævigata, B. Purdieana, B. retusa, B. subcolumnaris, B. Vahlii, B. Wrightii, Cæsalpinia crista, C. vesicaria, Cakile maritima, Calyptronoma Swartzii, Canavalia gladiata, Canna coccinea, C. glauca, Canella alba, Carica Papaya, Carludovica palmata, Cæsalpinia Bonduc, Casimiroa edulis, Castilloa elastica,* Cedrela odorata, Celtis Tala, Ceroxylon andicola,* C. Klopstockia (under Wettinia), Cestrum nocturnum, Chusquea abietifolia, C. Fendleri, C. Galeottiana, C. Muelleri, C. scandens, C. simpliciflora, C. uniflora (under Schizostachyum), Claytonia perfoliata, Coccoloba uvifera, Cocos regia, Copernicia nana, Cucurbita moschata, Cyperus giganteus, Dioscorea Cajennensis, D. esurientum, D. piperifolia, D. trifida, Epicampes macroura, Eriochloa polystachya, Euchlæna luxurians,* Eupatorium triplinerve, Fourcroya Cubensis, F. gigantea, F. longæva, Fuchsia splendens, Geonoma vaga, Gossypium Barbadense,* G. hirsutum,* G. religiosum,* Guadua amplexifolia, G. angustifolia,* G. latifolia,* Guayacum officinale, Hæmatoxylon Campecheanum, Hibiscus elatus, H. esculentus, Indigofera Anil,* Ipomœa Batatilla, Juniperus Bermudiana, Kunthia montana, Lantana crocea, Maclura tinctoria, Malvastrum spicatum, Mammea Americana, Maranta arundinacea, Melicocca bijuga, Mimusops globosa, M. Sieberi, Monstera deliciosa, Morus celtidifolia, Nageia coriacea, N. Purdieana, Nicotiana repanda, N. rustica, N. Tabacum,* Opuntia coccinellifera, O. Dillenii, O. elatior, O. Hernandezii, O. spinosissima, O. Tuna, Oreodoxa frigida, O. oleracea, O. regia, Pachyrrhizus angulatus, Panicum altissimum, P. divaricatum, P. molle,* P. Myurus, P. obtusum, P. striatum, Paspalum stoloniferum, Passiflora laurifolia, P. ligularis, P. maliformis, P. pedata, P. serrata, Peireskia aculeata, Persea gratissima, Pimenta communis, Pinus Cubensis,* Piscidia erythrina, Platenia Chiragua (under Wettinia), Plumiera acutifolia, Podachænium alatum, Polianthes tuberosa, Prestoa pubigera, Prunus occidentalis, Psidium acidum, P. Araca,* P. cordatum, P. Guayava,* P. polycarpum, Quercus agrifolia, Q. Castanea, Q. Skinneri,* Remirea maritima, Ribes floridum, Richardsonia scabra, Sabal umbraculifera, Schinus Molle, Sechium edule, Sesuvium Portulacastrum, Simaba Cedron, Smilax officinalis, S. papyracea, Solanum betaceum, S. Guineense, S. Plumieri, S. Topiro, S. torvum, Spondias lutea, Sporobolus Virginicus, Stylosanthes elatior, Swietenia Mahagoni,* Talinum patens, Terminalia Buceras, Thrinax argentea, T. parviflora, Tillandsia usneoides, Trophis Americana, Urenalobata, Vaccinium meridionale, V. Mortinia*, Wissa-

EASTERN SOUTH-AMERICA.

Acacia Cebil, A. macracantha, A. moniliformis, Acrocomia Totai (under Wettinia), Aira antartica, A. Magellanica, Albizzia Timbouva, Alibertia edulis, Alstrœmeria spectabilis, Ananas sativa,* Apium prostratum, Araucaria Brasiliensis,* Arauja albens, Arundinaria verticillata (under Schizostachyum), Arundo saccharoides, A. Sellowiana, Aspidosperma Quebracho, Bactris Gasipaes, Bertholletia excelsa,* Bixa Orellana, Boussingaultia baselloides, Briza Lamarckiana, B. stricta, B. triloba, Bromus unioloides,* Cæsalpinia coriaria, C. echinata, C. Gilliesii, Calyptranthes aromatica, Canna Achiras, Capsicum annuum, C. baccatum, C. frutescens, C. longum, C. microcarpum, Carex pumila, Cedrela fissilis, C. Velloziana, Celtis Sellowiana, C. Tala, Cephælis Ipecacuanha, Ceroxylon Klopstockia, Chenopodium ambrosioides, Chusquea capituliflora, C. Culeou, C. Gaudichaudiana (under Schizostachyum), C. Lorentziana, Cocos Australis, C. flexuosa, C. plumosa, C. Romanzoffiana, C. Yatay (under Wettinia), Copernicia cerifera,* Condalia microphylla, Cucurbita moschata,* Cyperus giganteus, Dalbergia nigra, D. Miscolobium, Danthonia picta, Desmodium triflorum, Dioscorea Brasiliensis,* D. conferta, D. dolecaneura,* D. piperifolia, D. subhastata, D. tuberosa, Diplothemium campestre, D. littorale (under Wettinia), Duvaua longifolia, Eryngium pandanifolium, Eugenia Nhanica, E. pyriformis, E. supra-axillaris, E. uniflora, Eupatorium tinctorium, Geonoma vaga, Gourlica decorticans, Guadua angustifolia, G. capitata, G. latifolia, G. macrostachya, G. paniculata, G. refracta, G. Tagoara, G. virgata, Gunnera manicata, Hancornia speciosa, Heterothalamus brunioides, Hevea Guianensis,* Hibiscus digitatus, Hordeum andicola, Hymenæa Caurbaril, Ilex Paraguensis, Indigofera Anil,* Ipomœa Batatas,* I. Batatilla, I. Megapotamica, I. operculata, I. paniculata, I. pes caprœ, Iriartea deltoidea, I. exorrhiza, I. ventricosa (under Wettinia), Jacaranda mimosifolia, Joannesia princeps, Koeleria caudata, Lippia citriodora, Loxopterygium Lorentzii, Maclura Mora, M. tinctoria, Malvastrum spicatum, Mammea Americana, Manihot Aipi,* M. Glaziovi,* M. utillissima,* Marliera glomerata, M. tomentosa, Melica sarmentosa, Merostachys Claussenii, M. Kunthii, M. ternata (under Schizostachyum), Myrtus Cisplatensis, M. edulis, M. incana, M. mucronata, Nageia Lamberti, Nicotiana rustica, N. glauca, N. Tabacum,* Ocimum gratissimum, Œnocarpus multicaulis (under Wettinia), Opuntia vulgaris, Oryza latifolia, Oryzopsis panicoides, Oxalis carnosa, O. connorrhiza, Pachyrrhizus angulatus, Panicum altissimum, P. barbinode, P. divaricatum, P. latissimum, P. molle,* P. Myurus, Parkinsonia aculeata, Paspalum notatum, P. ciliatum, P. dilatatum, P. undulatum, Passiflora actinia, P. alata, P. coccinea, P. cærulea, P. edulis, P. filamentosa, P. laurifolia, P. maliformis, P. mucronata, P. pedata, P. quadrangularis, P. serrata, P. suberosa, Paullinia sorbilis, Peireskia aculeata, P. Bleo, P. portulacifolia, Peltophorum Linnæi, Pennisetum latifolium, Periandra dulcis, Persea gratissima, Phaseolus adenanthus, P. coccineus,* P. inamœnus, P. lunatus,* P. Pallar, Physalis angulata, P. Peruviana, P. pubescens, Phytelephas macrocarpa, P. microcarpa,

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(under Wettinia), Pilocarpus pinnatifolius,* Piptadenia Cebil, P. rigida, Pircunia dioica, Poa Bergii, P. Forsteri,* Prosopis alba, P. dulcis, P. Siliquastrum, Psidium Araca,* P. arboreum, P. Cattleyanum,* P. chrysophyllum, P. cinereum, P. cuneatum, P. grandifolium, P. Guayava,* P. incanescens, P. lineatifolium, P. malifolium, P. polycarpon, P. rufum, Pterygota basiloxylon, Rubus imperialis, Salix Humboldtiana, Salpichroma rhomboidea, Salvia Matico, Sambucus Australis, Schinus Molle, Scirpus nodosus, Sesuvium Portulacastrum, Smilax papyracea, S. rubiginosa, Solanum Commersonii, S. Gilo, S. Guineense, S. indigoferum, S. Lycopersicum,* S. torvum, S. tuberosum,* Spilanthes oleracea, Sporobolus Indicus, Syagrus Sancona, Sterculia Carthaginensis, Tagetes glanduligera, Talinum patens, Tillandsia usneoides, Terminalia Buceras, Trithrinax Acanthocoma, T. Brasiliensis (under Wettinia), Trophis Americana, Ullucus tuberosus, Wissadula rostrata, Witheringia solanacea, Zea Mays,* Zizania microstachya, Zizyphus Mistal.

MIDDLE AFRICA [AND MADAGASCAR].

Acacia Arabica, A. Catechu, A. erubescens, A. Nilotica, A. stenocarpa, A. Verek, Acanthophœnix rubra, Acanthosicyos horrida,* Adansonia digitata, Æschynomene aspera,* Aloe Perryi, Andropogon annulatus, A. filipendulinus, Andropogon Ivarancusa, A. Nardus, Aristida prodigiosa,* A. pungens, Arundinella Nepalensis, Asplenium Nidus, Astragalus venosus, Beesha capitata, Boswellia papyracea, Buddlea Madagascariensis, Buxus Madagascarica, Canavalia gladiata, Cassia Absus, Casuarina equisetifolia, Chrysophyllum Africanum, Coffea Liberica,* Cola acuminata, Corchorus acutangulus, Corynosicyos edulis, Cucumis Anguria, Cudrania Javensis, Cupania sapida, Dalbergia melanoxylon, Dypsis pinnatifrons, Elæis Guineensis,* Eriochloa polystachya, Ficus Vogelii, Hagenia Abyssinica, Hibiscus Sabdariffa, Hymenæa verrucosa, Hyphæne Thebaica, Launea pinnatifida, Lepironia mucronata, Maclura excelsa, Malvastrum spicatum, Monodora Angolensis, M. Myristica, Musa Livingstoniana, Panicum coloratum, P. fluitans, P. molle, Pennisetum cenchroides, P. villosum, Pharnaceum acidum, Phœnix Canariensis, P. spinosa, Plectranthus Madagascariensis, Psophocarpus tetragonolobus, Pterolobium lacerans, Remirea maritima, Rosa sancta, Rubus rosifolius, Sesamum Indicum,* Solanum edule, S. Æthiopicum, S. macrocarpum, S. Thonningi, Strophanthus Kombe, Tamarix orientalis, Telfairia occidentalis, T. pedata, Trachylobium Hornemannianum, T. Petersianum, Trichodesma Zeylanicum, Ureno lobata, Vaccinium padifolium, Vahea florida,* V. Owariensis,* Vigna Sinensis,* Vitis asarifolia, V. Chantini, V. Schimperiana, Wissadula rostrata.

SOUTHERN AFRICA.

Aberia Caffra, A. tristis, A. Zeyheri, Acacia Giraffæ, A. horrida, Agaricus Georgii, Alchemilla Capensis, A. elongata, Aloe Bainesii, A. dichotoma, *A. ferox*, A. linguiformis, A. plicatilis, A. purpurascens, A.

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spicata, A. vera, A. Zeyheri, Andropogon Caffrorum*, Anthistiria ciliata,* Aponogeton distachyos, Aristida pungens, Arundinaria tesselata, Arundinella Nepalensis, Asparagus laricinus, Atriplex albicans, A. Capensis, Avicennia officinalis, Azima tetracantha, Barosma serratifolia, Brabejum stellatifolium, Buxus Macowani, Callitris arborea, Calodendron Capense, Cannamois cephalotes, Carissa Arduina, C. ferox, C. grandiflora, Carum Capense, Combretum butyraceum, Curtisia faginea, Doryalis zizyphoides, Ehrharta longiflora, Elegia nuda, Elephanthorrhiza Burchelli, Euclea myrtina, E. undulata, E. Pseudebenus, Eugenia Zeyheri, Exomis axyrioides, Garuleum bipinnatum, Gladiolus edulis, Gonioma Kamassia, Helichrysum vestitum, Hemarthria compressa, Hibiscus Ludwigii, Hyphæne ventricosa, Kochia pubescens,* Lasiocorys Capensis, Leonotis Leonurus, Leucadendron argenteum, Leyssera gnaphalioides, Lyperia crocea, Matricaria glabrata, Melianthus major, Mesembrianthemum acinaciforme, M. Barklyi, M. capitatum, M. crystallium, M. edule*, M. floribundum, Myrica cordifolia, M. quercifolia, M. serrata, Nageia elongata, N. Thunbergi, Nastus Borbonicus, Ocotea bullata, Osmitopsis asteriscoides, Osyris compressa, Panicum coloratum, P. roseum, Pappea Capensis, Parkinsonia Africana, Pelargonium odoratissimum,* P. peltatum, Pentzia virgata,* Phœnix reclinata, Phymaspermum parvifolium, Plectronia ciliata, P. spinosa, P. ventosa, Portulacaria Afra,* Protea mellifera, Psychotria Eckloniana, Rafnia amplexicaulis, R. perfoliata, Rhus lucida, Royenia Pseudebenus, R. pubescens, Rubus fruticosus, Salix Capensis, Scirpus nodosus, Selago leptostachya, Selinum anesorrhizum, S. montanum, Solanum Aculeastrum, Tarchonanthus camphoratus, Todea Africana, Voandzeia subterranea, Vangueria infausta, Withania somnifera.

WESTERN AUSTRALIA.

Acacia acuminata, A. aneura, A. armata, A. heteroclita, A. leiophylla,* A. microbotrya, A. Sentis, Adansonia Gregorii, Agonis flexuosa, Albizzia lophantha, A. procera, Astartea fascicularis, Atriplex cinereum, A. Muelleri, Avicennia officinalis, Bambusa Arnhemica, Boronia megastigma, Cassia artemisioides, Casuarina Decaisneana, C. distyla, C. Fraseriana, C. Huegeliana, C. trichodon, Conospermum Stoechadis, Danthonia bipartita, Dioscorea hastifolia, Duboisia Hopwoodii, Encephalartos Preissii, Erianthus fulvus, Eucalyptus calophylla, E. cornuta,* E. diversicolor, E. Doratoxylon, E. ficifolia, E. gomphocephala,* E. loxophleba,* E. marginata,* E. oleosa, E. patens, E. redunca,* E. rudis, E. salmonophloia, E. salubris, Grevillea annulifera, Helichrysum lucidum, Helipterum Manglesii, Hypoestes moschata, Jacksonia cupulifera, Kennedya Stirlingi, Kochia villosa, Lepidosperma gladiatum, Livistona Mariæ, Oryza sativa, Panicum flavidum, P. semialatum, Phaseolus Max, Pimelea clavata, Ptilotus hemisteirus, Santalum cygnorum, S. Preissianum, Scirpus nodosus, Sesbania Ægyptiaca, S. grandiflora, Spinifex hirsutus, S. longifolius, Tamarindus Indica, Waitzia corymbosa, Xanthorrhoea Preissii.

EASTERN AUSTRALIA (INCLUDING TASMANIA).

Acacia aneura, A. armata, A. binervata, A. dealbata, A. decurrens,* A. estrophiolata, A. excelsa, A. falcata, A. Farnesiana, A. fasciculifera, A. glaucescens, A. harpophylla, A. homalophylla, A. implexa, A. longifolia, A. Melanoxylon,* A. mollissima,* A. Osswaldi, A. pendula, A. penninervis, A. Peuce, A. polybotrya, A. pycnantha,* A. retinodes, A. salicina, A. Sentis, A. stenophylla, A. subporosa, Aciphylla glacialis, Aegiceras majus, Agrostis Muelleri, A. Solandri, Aira cæspitosa, Albizzia basaltica. Alchemilla vulgaris, Aleurites triloba, Alstonia constricta, Andropogon annulatus, A. Australis, A. bombycinus, A. erianthoides, A. falcatus, A. filipendulinus, A. Gryllos, A. montanus, A. Nardus, A. pertusus, A. refractus, A. sericeus, Angophora intermedia, A. lanceolata, A. subvelutina, Anthistiria avenacea, A. ciliata,* A. membranacea, Apium prostratum, Aponogeton crispus, Araucaria Bidwilli,* A. Cunninghami,* Aristolochia Indica, Arundinella Nepalensis, Astrebla pectinata,* A. triticoides,* Atalantia glauca, Atriplex cinereum, A. crystallinum, A. halimoides,* A. leptocarpum, A. Muelleri, A. nummularium,* A. semibaccatum, A. spongiosum,* A. stipitatum, A. vesicarium,* Avicennia officinalis, Backhousia citriodora, Bacularia monostachya, Barbarea vulgaris, Baloghia lucida, Brachychiton acerifolius, B. populneus, Cakile maritima, Callitris calcarata, C. columellaris, C. Endlicherii, C. Macleayana, C. Parlatorei, C. verrucosa, Carex pumila, Carissa Brownii, Cassia artemisioides, Casuarina Cunninghami, C. distyla, C. equisetifolia, C. glauca, C. quadrivalvis, C. suberosa, C. torulosa, Cedrela Australis,* Ceratopetalum apetalum, Chenopodium auricomum,* C. nitrariaceum, Chinonachne cyathopoda, Chloris scariosa, C. truncata, Citrus Australasica, C. Planchoni, Colocasia esculenta,* C. Indica, Corchorus acutangulus, C. Cunninghami, C. olitorious,* Cordyline terminalis, Crotalaria juncea,* C. retusa, Cudrania Javanensis, Cyathea medullaris, Cycas angulata, C. Normanbyana, Cynodon Dactylon,* Cyperus textilis, Dacrydium Franklini, Dammara robusta,* Danthonia bipartita, D. nervosa, D. penicillata,* D. robusta, Dicksonia Billardieri, Dioscorea bulbifera, D. transversa, Distichlis maritima, Drimys aromatica, Duboisia Hopwoodii, D. myoporoides, Dysoxylon Fraseri, D. Lesserti, D. Muelleri, Ectrosia Gulliverii, Ehrharta stipoides,* Embothrium Wickhami, Encephalartos Denisonii, E. spiralis, Eremophila longifolia, Erianthus fulvus, Eriochloa polystachya, Eucalyptus alpina, E. amygdalina,* E. Baileyana, E. botryoides,* E. capitellata, E. citriodora,* E. coccifera, E. cordata, E. corymbosa,* E. corynocalyx,* E. crebra, E. drepanophylla, E. eugenioides,* E. Globulus,* E. goniocalyx,* E. Gunnii,* E. hæmastoma, E. hemiphloia,* E. Howittiana,* E. largiflorens,* E. leptophleba, E. Leucoxylon,* E. longifolia,* E. macrorrhyncha,* E. maculata*, E. melanophloia, E. melliodora,* E. microcorys,* E. microtheca,* E. miniata, E. Muelleriana, E. obliqua,* E. ochrophloia, E. oleosa, E. paniculata, E. pauciflora, E. phœnicea, E. pilularis,* E. Planchoniana, E. platyphylla, E. polyanthema,* E. populifolia, E. punctata,* E. Raveretiana,* E. resinifera,* E. robusta,* E. rostrata,* E. saligna, E. *siderophloia*,* E. Sieberiana,* E. Staigeriana,* E. stellulata, E.

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glycyphylla, Solanum vescum, Spinifex hirsutus, S. paradoxus, Spondias Solandri, Stenocarpus sinuosus, Stenopetalum nutans, Stenotaphrum dimidiatum, Sterculia quadrifida, Stipa artistiglumis, Stylidium Vitiense, Syncarpia laurifolia, Synoon glandulosum, Tacca pinnatifida, Tetragonia expansa, T. implexicoma, Tetranthera laurifolia, Todea Africana, Tremella mesenterica, Trichodesma Zeylanicum, Triglochin procerum, Trigonella suavissima, Tristania conferta, Vigna lanceolata, Vitex trifolia, Vitis acetosa, V. Baudiniana, V. hypoglauca, Waitzia corymbosa, Xanthorrhœa Australis, X. hastilis, X. quadrangulata, X. resinosa, X. Tatei, Ximenia Americana, Zizyphus Jujuba, Zoysia pungens.

NEW ZEALAND.

Agrostis Solandri, Apium prostratum, Arundo conspicua, Avicennia officinalis, Carex pumila, Cordyline Banksii, C indivisa,* C. Sturmii, C. superbiens,* Corynocarpus lævigata, Cyathea medullaris, Dacrydium Colensoi, D. cupressinum, D. Kirkii, Dammara Australis,* Danthonia Cunninghami, Dicksonia Billardieri, Ehrharta Diplax, E. stipoides,* Fagus oliffortioides, F. fusca, F. Menziesii, F. Solandri, Festuca litoralis, Fuchsia excorticata, Heleocharis sphacelata, Hierochloa redolens, Hymenanthera Banksii, Ipomœa chrysorrhiza, Kentia sapida, Knightia excelsa, Libocedrus Doniana, Metrosideros florida, M. lucida, M. robusta, M. tomentosa, Myoporum lætum, Nageia dacrydioides, N. ferruginea, N. spicata, N. Totara, Panicum atro-virens, Phormium tenax,* Phyllocladus trichomanoides, Pittosporum eugenioides, P. Ralphii, P. tenuifolium, Poa cæspitosa, P. Colensoi, P. foliosa, Ripogonum scandens, Scirpus nodosus, Sebæa ovata, Stilbocarpa polaris, Tetragonia expansa, T. implexicoma, Triodia exigua, Trisetum antarcticum.

POLYNESIA.

Acacia Koa, Ægiceras majus, Aleurites triloba, Andropogon refractus, Araucaria Cookii,* A. excelsa,* A. Rulei, Aristolochia Indica, Artocarpus communis,* Bacularia Arfakiana, Batis maritima, Broussonetia papyrifera, Casuarina equisetifolia, Coix Lachryma, Colocasia esculenta, C. Indica, Cordyline Baueri, C. terminalis, Cyathea medullaris, Cyrtosperma edule, Dammara macrophylla, D. Moorei, D. obtusa, D. ovata, D. Vitiensis, Dioscorea aculeata,* D. alata,* D. bulbifera, D. nummularia, D. pentaphylla, Eugenia Jambolana, Exidia auricula Judæ, Gossypium Taitense, G. tomentosum, Heleocharis sphacelata, Illippe Cocco, I. Erskiniana,* I. Maclayana, Ipomœa paniculata, Kentia Baueri, K. Beccarii, Lagerstroemia Indica, Metrosideros polymorpha, Musa Troglodytarum, Ocimum gratissimum, Pipturus propinquus, Pringlea antiscorbutica, Pritchardia Gaudichaudi, P. Martii, P. Thurstoni, Ptychosperma Arfakiana, Rubus Hawaiensis, R. Macreai,* Saccharum officinarum,* Santalum Freycinetianum, S. Yasi, Solanum Uporo, Spondias dulcis, Stylidium Vitiense, Tacca pinnatifida, Tetragonia expansa, Tonchardia latifolia,

I.

IMPORTANT CULTURAL PLANTS, YIELDING A RETURN IN ONE YEAR, BUT REQUIRING RENEWAL.

[Annuals, including some few Biennials.]

Allium Ampeloprasum, A. Ascalonicum, A. Cepa, A. fistulosum, A Porrum, A. sativum, A. Schœnoprasum, A. Scorodoprasum, Andropogon saccharatus, A. Sorghum, Apium graveolens, Arachis hypogæa, Avena sativa, Beta vulgaris, Brassica alba, B. nigra, B. oleracea, Cannabis sativa, Capsicum annuum, Carum Petroselinum, Chærophyllum bulbosum, Cicer arietinum, Cichorium Endivia, Corchorus capsularis, C. olitorius, Crotalaria juncea, Cucumis Citrullus, C. Melo, C. sativus, Cucurbita Pepo, Daucus Carota, Dioscorea aculeata, D. alata, D. Batatas, D. nummularia, D. pentaphylla, D. sativa, Dolichos Lablab, Ervum Lens, Euchlæna luxurians, Fagopyrum emarginatum, F. esculentum, F. Tataricum, F. triangulare, Glycine hispida, Helianthus annuus, Hibiscus esculentus, Hordeum deficiens, H. distichon, H. hexastichon, H. vulgare, H. zeocriton, Ipomœa Batatas, Lactuca sativa, Linum usitatissimum, Lupinus albus, L. angustifolius, L. luteus, L. varius, Medicago orbicularis, M. scutellata, Nicotiana Tabacum, Oryza sativa, Panicum Crus Galli, P. frumentaceum, P. Italicum, P. miliaceum, P. sanguinale, Papaver somniferum, Pennisetum typhoideum, Peucedanum sativum, Phalaris Canariensis, Phaseolus derasus, P. lunatus, P. Max, P. vulgaris, Physalis pubescens, Pisum sativum, Raphanus sativus, Rumex vesicarius, Secale cereale, Sesamum Indicum, Sesbania cannabina, Solanum Lycopersicum, S. tuberosum, Spinacia oleracea, Tragopogon porrifolius, Trapa natans, Trifolium Alexandrinum, T. furcatum, T. incarnatum, T. pratense, T. reflexum, T. resupinatum, T. spadiceum, Triticum vulgare, Vicia Faba, V. sativa, Vigna Sinensis, Zea Mais (Manihot here also referable.)

II.

IMPORTANT CULTURAL PLANTS, YIELDING A RETURN IN THE FIRST OR SECOND SEASON AND ALSO FOR SOME YEARS AFTERWARDS.

[Perennials and several Shrubs.]

Æschynomene aspera, Agrostis alba, A. rubra, Aloe ferox, A. linguiformis, A. Perryi, A. purpurascens, A. vera, A. vulgaris, Alopecurus pratensis, Ananas sativa, Andropogon Haleppensis, Anthistiria ciliata, Artemisia Dracunculus, Arundinaria spathiflora, Asparagus officinalis, Astrebla pectinata, A. triticoides, Atriplex halimoides, A. nummularium, A. vesicarium, Bambusa arundinacea, B. Balcooa, B. spinosa, B. vulgaris, Boehmeria nivea, Bromus uniolides, Cajanus Indicus, Canavalia gladiata, Canna Achiras, C. coccinea, C. edulis, C. glauca, Capparis spinosa, Capsicum frutescens, Cedronella triphylla, Chenopodium auriconum, Chrysanthemum cinerarifolium, C. coronopifolium, C. roseum, Cichorium Intybus, Cochlearia Armoracia, Crambe cordifolia, C. maritima, C. Tatarica, Curcuma longa, Cynodon Dactylon, Cyperus esculentus, Cytisus scoparius, Dactylis glomerata, Danthonia

IMPORTANT CULTURAL PLANTS —*continued.*

penicillata, Dendrocalamus Brandisii, D. giganteus, D. strictus, Desmodium triflorum, Elymus arenarius, Fagopyrum cymosum, Festuca elatior, F. ovina, Fragaria Californica, F. Chiloensis, F. collina, F. grandiflora, F. Illinoensis, F. pratensis, F. vesca, F. Virginiana, Gigantochloa Apus, G. atter, G. maxima, G. robusta, Glycyrrhiza glabra, Gossypium arboreum, G. Barbadense, G. herbaceum, G. hirsutum, G. religiosum, Guadua angustifolia, G. latifolia, Hedysarum coronarium, Helianthus tuberosus, Humulus Lupulus, Indigofera Anil, I. tinctoria, Jasminum grandiflorum, J. odoratissimum, J. officinale, J. Sambac, Kochia villosa, Lavandula angustifolia, L. latifolia, L. Stœchas, Lippia citriodora, Lolium prenne, Lotus corniculatus, Lupinus arboreus, L. Douglasii, Manihot Aipi, M. utilissima, Medicago sativa, Mentha piperita, Monstera deliciosa, Morus alba, Musa Cavendishii, M. paradisiaca, M. simiarum, Nelumbo lutea, N. nucifera, Ocimum gratissimum, Onobrychis sativa, Origanum Majorana, Oryzopsis multiflora, Panicum decompositum, P. maximum, P. spectabile, Pappophorum commune, Paspalum distichum, Passiflora alata, P. edulis, P. ligularis, P. macrocarpa, P. quadrangularis, Pelargonium capitatum, P. odoratissimum, P. Radula, Phaseolus coccineus, Phleum pratense, Phormium tenax, Phyllostachys bambusoides, P. nigra, Physalis Peruviana, Pimpinella Sisarum, Poa arachnifera, P. Brownii, P. Forsteri, P. pratensis, P. trivialis, Portulacaria Afra, Psamma arenaria, Rheum australe, R. officinale, R. palmatum, R. Rhaponticum, Ribes floridum, R. Griffithii, R. Grossularia, R. hirtellum, R. nigrum, R. rubrum, Ricinus communis, Rosa centifolia, R. Damascena, R. moschata, R. sempervirens, Rubia tinctorum, Rubus cæsius, R. Canadensis, R. deliciosus, R. ellipticus, R. fruticosus, R. geoides, R. Idæus, R. imperialis, R. lasiocarpus, R. Macreai, R. nutans, R. occidentalis, R. phœnicolasius, R. rugosus, R. strigosus, R. trivialis, R. ursinus, R. villosus, Rumex Acetosa, R. Patientia, R. scutatus, Salix purpurea, S. rubra, S. triandra, S. viminalis, Scorzonera crocifolia, S. deliciosa, S. Hispanica, S. tuberosa, Sechium edule, Sesbania Ægyptiaca, Sesleria cœrulea, Solanum betaceum, Stachys tuberifera, Stenotaphrum Americanum, Symphytum peregrinum, Tinguarra Sicula, Trifolium agrarium, T. alpestre, T. fragiferum, T. hybridum, T. medium, T. montanum, T. ochroleucum, T. Pannonicum, T. repens, Vaccinium cæspitosum, V. Canadense, V. corymbosum, V. erythrocarpum, V. humifusum, V. macrocarpon, V. myrtilloides, V. Myrtillus, V. ovalifolium, V. ovatum, V. Oxycoccos, V. Pennsylvanicum, V. vacillans, Zingiber officinale (Bamboos last for many years).

III.

IMPORTANT CULTURAL PLANTS, YIELDING A RETURN IN THE THIRD OR FOURTH SEASON AND FOR SOME OR MANY YEARS AFTERWARDS.

[Shrubs and some small Trees.]

Aberia Caffra, Agave Americana, A. heteracantha, A. inæquidens, A. rigida, Alibertia edulis, Aloe dichotoma, A. plicatilis, A. spicata,

IMPORTANT CULTURAL PLANTS—*continued.*

Arundinaria spathiflora, Astragalus adscendens, A. brachycalyx, A. Cephalonicus, A. Creticus, A. gummifer, A. microcephalus, A. Parnassi, A. verus, Atriplex Capense, Camellia Thea, Carica Candamarcensis, C. Papaya, Citrus Aurantium, C. medica, Coffea Arabica, Dendrocalamus Brandisii, D. giganteus, D. strictus, Erythroxylon Coca, Gaylussacia frondosa, G. resinosa, Ilex Paraguensis, Laurus nobilis, Myrtus Ugni, Olea Europæa, Opuntia coccinellifera, O. Hernandezii, O. Tuna, Photinia eriobotrya, Pilocarpus pinnatifolius, Pistacia Lentiscus, P. Terebinthus, Prunus Amygdalus, P. Armenica, P. Cerasus, P. domestica, P. Persica, Psidium Cattleyanum, P. Guayava, P. polycarpon, Pyrus communis, P. Cydonia, P. Malus, Rhamnus catharticus, Rhus coriaria, R. Cotinus, R. glabra, R. typhina, Vaccinium Leschenaultii, V. leucanthum, V. meridionale, V. Mortinia, V. padifolium, V. parvifolium, V. pendulifiorum, V. reticulatum, Vitis æstivalis, V. candicans, V. cinerea, V. cordifolia, V. Labrusca, V. riparia, V. rupestris, V. Schimperiana, V. vinifera, V. vulpina, Yucca aloifolia, Y. brevifolia, Y. filamentosa, Y. gloriosa, Y. Yucatana, Zizyphus Jujuba.

IV.

IMPORTANT CULTURAL PLANTS, YIELDING A RETURN AFTER SEVERAL YEARS AND OFTEN FOR MANY SUBSEQUENT YEARS ALSO.

[Trees, mostly large.]

Acacia aneura, A. Arabica, A. Catechu, A. decurrens, A. Koa, A. leiophylla, A. Melanoxylon, A. microbotrya, A. mollissima, A. pycnantha, A. Verek, Acer saccharinum, Achras Sapota, Albizzia Saman, Amelanchier Botryapium, Anona Cherimolia, Argania Sideroxylon, Buxus Macowani, B. sempervirens, Cillitris cupressiformis, C. quadrivalvis, C. verrucosa, Carya alba, C. amara, C. glabra, C. microcarpa, C. oliviformis, C. sulcata, C. tomentosa, Casimiroa edulis, Castanea sativa, Castilloa elastica, Cedrela Australis, C. Sinensis, C. Taona, Ceratonia Siliqua, Ceroxylon andicola, Chrysophyllum Africanum, Cinchona Calisaya, C. cordifolia, C. micrantha, C. nitida, C. officinalis, C. succirubra, Cocosmanthus macrophyllus, Cola acuminata, Copernicia cerifera, Corylus Avellana, C. Colurna, C. maxima, C. Pontica, C. rostrata, Dammara australis, D. robusta, Dichopsis Gutta, Diospyros Ebenum, D. Kaki, D. Virginiana, Elæis Guineensis, Eucalyptus citriodora, E. crebra, E. Globulus, E. gomphocephala, E. goniocalyx, E. Leucoxylon, E. melliodora, E. rostrata, E. saligna, E. siderophloia, Ficus Carica, F. elastica, Fraxinus Americana, F. excelsior, F. Ornus, F. quadrangulata, Garcinia Xanthochymus, Ginkgo biloba, Guevina Avellana, Hæmatoxylon Campechianum, Hevea Guianensis, Hovenia dulcis, Hymenæa Courbaril, Illippe sericea, Jubæa spectabilis, Juglans cinerea, J. nigra, J. regia, Juniperus Bermudiana, J. Chinensis, J. drupacea, J. Virginiana, Liquidambar Altingia, L. orientalis, L. styraciflua, Macadamia ternifolia, Mangifera Indica, Mimusops Elengi, M. Manil-

IMPORTANT CULTURAL PLANTS—*continued.*

kara, Morus nigra, M. rubra, Nephelium Litchi, Palaquium Gutta, P. Krantzianum, Persea gratissima, Phœnix dactylifera, Pimenta communis, Pinus Abies, P. amabilis, P. australis, P. balsamea, P. Cedrus, P. cembroides, P. Coulteri, P. Douglasii, P. edulis, P. excelsa, P. Fraseri, P. Gerardiana, P. Haleppensis, P. Hartwegii, P. Kæmpferi, P. Lambertiana, P. Laricio, P. Larix, P. longifolia, P. mitis, P. monticola, P. nigra, P. Picea, P. Pinaster, P. Pinea, P. ponderosa, P. radiata, P. rigida, P. Sabiniana, P. silvestris, P. Sitkensis, P. Strobus, P. Webbiana, Pistacia vera, Populus alba, P. monilifera, P. nigra, Quercus Ægilops, Q. alba, Quercus Ballota, Q. Cerris, Q. chrysolepis, Q. coccinea, Q. Douglasii, Q. Garryana, Q. Ilex, Q. incana, Q. lyrata, Q. macrocarpa, Q. macrolepis, Q. Phellos, Q. Robur, Q. serrata, Q. Skinneri, Q. Suber, Q. virens, Sequoia sempervirens, S. Wellingtonia, Spondias dulcis, Swietenia Mahagoni, Taxodium distichum, Thuya gigantea, Tilia Americana, T. Europæa, Ulmus campestris, U. fulva, U. racemosa.

All these plants fit for extra-tropical countries, but many only for particular climatic regions; for information in respect to the latter the geographic index is to some extent indicative.

V.

IMPORTANT CULTURAL PLANTS ADAPTED ONLY FOR FROSTLESS REGIONS.

[Contained within the following genera.]

Acanthophœnix, Acanthosicyos, Achras, Acrocomia, Æschynomene, Albizzia, Aleurites, Alibertia, Aloexylon, Alstonia, Amorphophallus, Ananas, Andropogon, Anona, Aponogeton, Aquilaria, Arenga, Artocarpus, Arundinaria, Arundinella, Atalantia, Averrhoa, Bactris, Bacularia, Baloghia, Balsamodendron, Bambusa, Basella, Beesha, Beninçasa, Boehmeria, Borassus, Boswellia, Brahea, Bursera, Butea, Cæsalpinia, Cajanus, Calamus, Calyptranthes, Calyptronoma, Camellia, Canavalia, Capsicum, Carica, Carludovica, Caryota, Casimiroa, Cassia, Castilloa, Catha, Cedrela, Cephaelis, Cereus, Ceroxylon, Cervantesia, Cestrum, Chamædora, Chionachne, Chloroxylon, Cinchona, Cinnamomum, Clausena, Coccoloba, Cocos, Coffea, Cola, Colocasia, Combretum, Copernicia, Corchorus, Corynosicyos, Crotalaria, Croton, Cupania, Curcuma, Cycas, Dalbergia, Dendrocalamus, Dimochloa, Dioscorea, Diospyros, Elœis, Engelhardtia, Erythroxylon, Euchlæna, Ficus, Flacourtia, Flemingia, Garcinia, Geonoma, Gigantochloa, Guadua, Guizotia, Gynocardia, Hæmatoxylon, Hagen. Hancornia, Hardwickia, Heterothalamus, Hevea, Hyphæne, Illippe, Indigofera, Launea, Maba, Machilus, Malachra, Mangifera, Manihot, Maoutia, Maranta, Marlea, Marliera, Mauritia, Melanorrhœa, Melicocca, Melocalamus, Melocanna, Mimusops, Monodora, Murraya, Musa, Nastus, Nyctanthes, Oncosperma, Oreodoxa, Owenia, Palaquium, Pandanus, Parinarium, Paulinia, Peireskia, Peltophorum, Persea, Phyllanthus, Pilocarpus, Pimenta, Piscidia, Plectocomia, Plectranthus, Plumiera,

IMPORTANT CULTURAL

Pogostemon, Pouzolzia, Prestoa, P
Saccharum, Sanseviera, Schima,
Simaba, Spondias, Sterculia, Str
Tacca, Tamarindus, Tectona, Tein
Thouarea, Touchardia, Triphasia,
brunia, Voandzeia, Wettinia, Wi
Xylia, Zingiber.

VI.

IMPORTANT CULTURAL PLANTS ADAPTED FOR VERY COLD REGIONS.

[Contained within the following genera.]

Acer, Achillea, Aconitum, Acorus, Actæa, Actinidia, Æsculus, Agrostis, Aira, Alchemilla, Alkanna, Allium, Alnus, Alopecurus, Althæa, Amelanchier, Andropogon, Anthemis, Anthoxanthum, Anthyllis, Apium, Archangelica, Arctostaphylos, Arnica, Artemisia, Asparagus, Asperula, Astragalus, Atriplex, Avena, Barbarea, Berberis, Beta, Betula, Brassica, Bromus, Butomus, Buxus, Cakile, Camelina, Cannabis, Caragana, Carex, Carpinus, Carthamus, Carum, Carya, Castanea, Celtis, Cetraria, Chærophyllum, Chelidonium, Chondrus, Cichorium, Cochlearia, Colchicum, Conium, Convallaria, Coriandrum, Cornus, Corylus, Crambe, Cratægus, Crocus, Cucumis, Cucurbita, Cupressus, Cynara, Cynodon, Cynosurus, Cyperus, Dacrydium, Dactylis, Danthonia, Daucus, Digitalis, Diospyros, Elymus, Ervum, Fagopyrum, Fagus, Ferula, Festuca, Fitzroya, Fragaria, Fraxinus, Galega, Gaulthieria, Gentiana, Geum, Gymnocladus, Hedera, Helianthus, Helichrysum, Helleborus, Hierochloa, Hippocrepis, Holcus, Hordeum, Humulus, Hyoscyamus, Ilex, Isatis, Juglans, Juniperus, Kœleria, Lactuca, Lathyrus, Lavandula, Lavatera, Lepidium, Linum, Lolium, Lotus, Lupinus, Lycium, Marrubium, Matricaria, Medicago, Melica, Melilotus, Mentha, Menyanthes, Milium, Monarda, Montia, Morchella, Morus, Myrrhis, Nageia, Nepeta, Nicotiana, Nyssa, Ocimum Onobrychis, Origanum, Oxalis, Oxytropis, Panicum, Papaver, Peucedanum, Phalaris, Phaseolus, Phleum, Phormium, Physalis, Pimpinella Pinus, Picea, Plantago, Platanus, Poa, Populus, Porphyra, Prangos, Pri nus, Psamma, Pyrus, Quercus, Raphanus, Reseda, m, Ribes, Rosa, Rosmarinus, Rubia, Rubus, Rumex, , Salix, Salvia, Sambucus, Sanguinaria, Sanguisorba, o-Gothaea, Scandix, Scorzonera, Secale, on, Sola[illegible], Spartina, Spartium, Sperbocarpa, Symphytum, Tamarix, Tana- nuya, Thymus, Tilia, Tragopogon, Trapa, um, Tropæolum. Tulipa, Typha, Ulex, , Valerianella, Veratrum, Vicia, Viola,

VII.

IMPORTANT CULTURAL PLANTS, ADAPTED EVEN FOR THE DRIEST CLIMATE.

[Contained within the following genera.]

Acacia, Acanthosicyos, Agriophyllum, Albizzia, Allium, Aloe, Anabasis, Andropogon, Anthistiria, Arachis, Aristida, Astragalus, Atriplex, Avena, Beta, Bouteloua, Brassica, Bromus, Callitris, Capparis, Casuarina, Ceratonia, Cereus, Chenopodium, Cucumis, Cucurbita, Cynodon, Cyperus, Dactylis, Danthonia, Daucus, Dorema, Duboisia, Ehrharta, Eremophila, Erianthus, Eriochloa, Erodium, Ervum, Eucalyptus, Exomis, Fagopyrum, Ficus, Grevillea, Helianthus, Helichrysum, Holcus, Hordeum, Ipomœa, Jacksonia, Kochia, Lactuca, Lasiocorys, Lathyrus, Lespedeza, Medicago, Mesembrianthemum, Milium, Neurachne, Ornithopus, Oryzopsis, Oxytropis, Panicum, Pappophorum, Parinarium, Pentzia, Peucedanum, Phaseolus, Phœnix, Phymaspermum, Physalis, Pinus, Pisum, Poa, Portulacaria, Prunus, Raphanus, Rhagodia, Rhus, Ricinus, Rumex, Sanguisorba, Santalum, Scorzonera, Secale, Sesbania, Solanum, Spergula, Spinifex, Sporobolus, Stenopetalum, Stenotaphrum, Stipa, Telfairia, Tetragonia, Trichodesma, Trigonella, Triticum, Vicia, Vigna, Vitis.

INDEX TO VERNACULAR NAMES.

Abele ... Populus alba
Aboh-fruit ... Vahea florida
Absinthe ... Artemisia Absinthium
Acacia, locust Robinia Pseudacacia
Acajou-wood Cedrela Brasiliensis
Adam's Needle Yucca filamentosa
Adeira ... Canna edulis
Agallochum ... Aquilaria agallocha
Agar-Agar ... Gracilaria lichenoides
Agath-Dammar Dommara alba
Aggur ... Aquilaria agallocha
Aguacate ... Persea gratissima
Akala ... Rubus Macraei
Akamatsou ... Pinus densiflora
Akee ... Cupania sapida
Akeki ... Thuya dolabrata
Alder ... Alnus glutinosa
Aleppo-grass Andropogon Halepensis
Alerce .. Fitzroya Patagonica
Alexandra-Palm Ptychosperma Alexandrae
Alfa ... Stipa tenacissima
Alfalfa ... Medicago sativa
Algaroba ... Ceratonia Siliqua
Algorobillo ... Cæsalpinia brevifolia
Alisander ... Smyrnium Olusatrum
Alkanna ... Alkanna tinctoria
„ spurious Lithospermum canescens
Alkanet ... Lithospermum canescens
Almond-tree... Prunus Amygdalus
Aloe, gigantic Agave Americana
„ branched Aloe dichotoma
„ yellow-flowered „ vulgaris
Aloe-wood ... Aloexylon Agallochum
Aloja ... Prosopis dulcis
Alvarillo ... Ximenia Americana
Allspice-tree... Pimenta communis
Ambari-Hemp Hibiscus cannabinus
Angelica ... Archangelica officinalis
Angico-gum ... Piptadenia rigida
Anise ... Pimpinella Anisum
Anyam ... Pennisetum cenchroides
Apple-tree ... Pyrus Malus
Apple-gumtree Eucalyptus Stuartiana
Apple-haw ... Crataegus aestivalis
Apple, Kei- ... Aberia Caffra
Apricot-tree ... Prunus Armeniaca
Aracacha, spurious Oxalis esculenta
Aracua ... Adenostemum nitidum
Arbor vitæ ... Thuya occidentalis
Argan-tree ... **Argania Sideroxylon**
Arhar ... **Cajanus Indicus**
Aroche ... **Atriplex hortense**
Arrowroot ... **Maranta arundinacea**
„ ... Tacca pinnatifida
„ ... Canna edulis
Artichoke ... Cynara Scolymus
„ ... Helianthus tuberosus
Ash-tree ... Fraxinus, several
Asparagus ... Asparagus officinalis
Aspen ... Populus tremula
Assa fetida ... Ferula Assa fœtida
Atocha ... Stipa tenacissima
Aubergine ... Solanum Melongena
Avens ... Geum urbanum
Avocado-pear **Persea gratissima**

Baboor ... **Acacia Arabica**
Babur ... „ „
Badjong ... **Acacia microbotrya**
Bajree ... **Pennisetum thyphoideum**
Bajrek ... **Pennisetum thyphoideum**
Balata ... Mimusops globosa
Balm-herb ... Melissa officinalis
Balmony ... Chelone glabra
Balsam, Gilead Balsamodendron Opobalsamum
Ballota ... Quercus Ballota
Bamboo-reed Arundo Donax
Bamboos ... Bambusa
„ ... Beesha
„ ... Dendrocalamus
„ ... Gigantochloa
„ ... Guadua
„ ... Melocalamus
„ ... Melocanna
„ ... Phyllostachys
„ ... Schizostachyum
„ ... Teinostachyum
„ ... Thamnocalamus
Banana ... Musa sapientum
Bandakai ... Hibiscus esculentus
Baneberry ... Actaea spicata
Bangalay ... Eucalyptus botryoides
Banyan-tree Australian Ficus columnaris
Banyan-tree Indian „ Indica or Bengalensis
Barley ... Hordeum, several
Barnyard-grass Panicum Crus Galli
Basil ... Ocimum Basilicum
Basswood-tree Tilia Americana
Bastard-Mahogany Eucalyptus botryoides
Battari Andropogon saccharatus

INDEX TO VERNACULAR NAMES—*continued.*

Bay-waxberry	Myrica cerifera
Bay-tree, American	Umbellularia Californica
Bay, sweet ...	Laurus nobilis
Beach-plum ...	Prunus maritima
Bean, Broad...	Vicia faba
„ Field ...	„ „
„ French	Phaseolus vulgaris
„ Haricot	„ „
„ Horse...	Vicia faba
„ Kidney	Phaseolus vulgaris
„ Lima ...	„ lunatus
„ Straight	Vicia faba
„ Windsor	„ „
Beebalm-Tea	Monarda didyma
Beeches ...	Fagus, several
Beet ...	Beta vulgaris
Begoon ...	Solanum Melongena
Bembil ...	Eucalyptus populifolia
Bent-grass ...	Agrostis palustris
„ „ ...	Psamma arenaria
Berberry-bush	Berberis, several
Bermuda-grass	Cynodon Dactylon
Bdellium-resin	Balsamodendron Mukul
Bhabar ...	Andropogon involutus
Bhaib-grass ...	„ „
Bilberry-bush	Vaccinium Myrtillus
Birch, White	Betula alba
„ Cherry	„ lenta
„ Yellow or Grey	„ lutea
„ Red ...	„ lutea
„ River ...	„ nigra
„ Paper...	„ papyracea
Birdsfoot-Clover	Ornithopus sativus
„ Trefoil	Lotus corniculatus
Bitternut-tree	Carya amara
Birthroot ...	Trillium erectum
Blackbutt-tree	Eucalyptus pilularis
Black Gum-tree	Nyssa multiflora
Blackberry-bush	Rubus fruticosus
Blackthorn ...	Prunus spinosa
Blackwood-tree	Acacia Melanoxylon
Blood-root ...	Sanguinaria Canadensis
Bloodwood-tree	Eucalyptus corymbosa
Blue grass ...	Poa pratensis
„ Kentucky	„
„ Texas ...	Poa arachnifera
Blue Gum-tree	Eucalyptus globulus
„ ...	„ saligna
Blue berry ...	Vaccinium corymbosum
Bluets ...	„ myrtilloides
Bogbean ...	Menyanthes trifoliata
Bogum ...	Flindersia Oxleyana
Boighe ...	Drimys Winteri
Bolodo ...	Peumus Boldus
Box-Elder ...	Acer Negundo
Box-Thorn ...	Lycium Europaeum
Box-tree, Bastard	Eucalyptus goniocalyx
„ Common	„ hemiphloia
„ „	„ largiflorens
„ Yellow	„ melliodora
„ Red ...	„ polyanthema
„ Shining	„ populifolia
„ South-African	Buxus Macowani
„ Turkey	„ sempervirens
Bramble ...	Rubus fruticosus
Basiletto-wood	Peltophorum Linnaei
Brazil-wood ...	Cæsalpinia echinata
Brea-turpentine	Pinus Teocote
Breadfruit-tree	Artocarpus communis
Bringal ...	Solanum Melongena
Broccoli ...	Brassica oleracea
Broom-bush ...	Cytisus scoparius
Broom-corn ...	Andropogon saccharatus
Broom-root ...	Epicampes macroura
Broussa-tea ...	Vaccinum Arctostaphylos
Brussels-sprouts	Brassica oleracea
Bucco ...	Barosma serratifolia
Buckthorn ...	Rhamnus catharticus
Buckeye ...	Æsculus lutea
Buckwheat ...	Fagopyrum, several
Buffalo-berry	Shepherdia argentea
Buffalo-grass	Buchloe dactyloides
„ ...	Stenotaphrum Americanum
„ ...	Tripsacum dactyloides
Bullace ...	Prunus insititia
Bullrush ...	Typha latifolia
Bunch-grass...	Elymus condensatus
„ ...	Festuca flava
„ ...	Oryzopsis cuspidata
Bunya-Bunya	Araucaria Bidwilli
Bur-Oak ...	Quercus macrocarpa
Burmah-wood	Tectona Hamiltoniana
Burnet ...	Sanguisorba minor
Butter-tree ...	Combretum butyraceum
Butternut-tree	Juglans cinerea
Button-Snake-root	Liatris odoratissima
Button-wood	Platanus occidentalis
Cabbage ...	Brassica oleracea
„ Kerguelen	Pringlea antiscorbutica
Caffir-corn ...	Andropogon saccharatus
Caffir-thorn ...	Lycium Afrum

INDEX TO VERNACULAR NAMES—*continued.*

Cainito, Australian	Niemeyera prunifera
Cajaput-tree	Melaleuca Leucadendron
Calambac	Aquilaria Agallocha
Calamus-grass	Andropogon Calamus
Calla, large	Richardia Africana
Calool	Sterculia quadrifida
Camata	Quercus Ægilops
Camatena	„ „
Cambuca	Marliera glomerata
Camelthorn	Acacia giraffæ
Camphor-tree	Cinnamomum Camphora
Canada Rice	Zizania aquatica
Canaigre	Rumex hymenosepalus
Canary-grass	Phalaris Canariensis
Candlenut-tree	Aleurites triloba
Cane, sweet	Andropogon Calamus
Canelo	Drimys Winteri
Caoutchouc-climber	Vahea Owariensis
Caoutchouc-tree	Castilloa elastica
„	Ficus elastica
„	Hevea Guianensis
Cape-Gooseberry	Physalis Peruviana
Caper-plant	Capparis spinosa
Caragaheen	Chondrus crispus
Caraguta	Eryngium pandanifolium
Caraway	Carum Carui
Cardoon	Cynara Cardunculus
Carnauba-Palm	Copernicia cerifera
Carob-tree	Ceratonia Siliqua
Carrot	Daucus Carota
Carrot-tree	Thapsia edulis
Cartagena-bark	Cinchona cordifolia
Cashaw-tree	Prosopis dulcis
Cassava	Manihot Aipi
„	Manihot utilissima
Cassia-bark	Cinnamomum Cassia
Castoroil-plant	Ricinus communis
Cath-tea	Catha edulis
Catechu-tree	Acacia Catechu
Catjang	Cajanus Indicus
Catmint	Nepeta Cataria
Catstail-grass	Phleum pratense
Cattail	Typha latifolia
Cauliflower	Brassica oleracea
Cavan	Acacia Cavenia
Caviuna-wood	Dalbergia nigra
Cayenne-Pepper	Capsicum annuum
Ceara-Rubber	Manihot Glaziouii
Cedar, Australian Red	Cedrela Australis
„ Bastard	Sequoia sempervirens
„ Bermuda	Juniperus Bermudiana
„ Deodara	Pinus Deodra
Cedar, Goa	Cupressus glauca
„ Japanese	Cryptomeria Japonica
„ Lebanon	Pinus Cedrus
„ Northern White	Cupressus thuyoides
„ Oregon	Cupressus fragrans
„ Pencil	Juniperus Bermudiana
„ „	„ Virginiana
„ Red	Cedrela Toona
„ Red Oregon	Thuya gigantea
„ Redwood	Sequoia sempervirens
„ Singapore	Cedrela Toona
„ White	Cupressus thurifera
„ Yellow	„ Nutkaensis
Celandine	Chelidonium majus
Celery	Apium graveolens
„ Australian	„ prostratum
Celery-Pine	Phyllocladus trichomanoides
Chamomile	Anthemis nobilis
„ annual	Matricaria Chamomilla
Chanar	Gourliea decorticans
Chantarelle	Cantharellus edulis
Chayota	Sechium edule
Chelem	Agave rigida
Cherimoyer	Anona cherimolia
Cherry	Prunus Cerasus
„ Black	„ serotina
„ Choke	„ Virginiana
Cherry-Capsicum	Capsicum baccatum
Cherry-Laurel	Prunus Lauro-Cerasus
Cherry-Plum	Prunus cerasifera
Chervil	Anthriscus Cerefolium
„	Chærophyllum bulbosum
„ Sweet	Myrrhis odorata
Chestnut-Oak	Quercus Castanea
„	„ Prinus
Chestnut-tree	Castanea sativa
„ wild	Calodendron Capense
Chick-pea	Cicer arietinum
Chicory	Cichorium Intybus
Chicot	Gymnocladus Canadensis
Chillies	Capsicum annuum
Chinese Cinnamon	Cinnamomum Cassia
Chinquepin	Nelumbo lutea
Chiretta	Swertia Chirata
Chives	Allium Schœnoprasum
Chocho	Sechium edule
Christ-Thorn	Paliurus Spina Christi
Christmas-Rose	Helleborus niger
Chufa	Cyperus esculentus
Chulmugra-Oil	Gynocardia odorata

INDEX TO VERNACULAR NAMES—*continued.*

Chusan-Palm	Chamærops excelsa
Cicely ...	Myrrhis odorata
Cider-Gum tree	Eucalyptus Gunnii
Cinnamon-tree	Cinnamomum Cassia
Ciruelillo ...	Embothrium coccineum
Citron-tree ...	Citrus Medica
Cloudberry-bush	Rubus Chamæmorus
Clover, Alsike	Trifolium hybridum
,, Bersin ..	,, Alexandrinum
,, Birdsfoot	Ornithopus sativus
,, Bokhara	Melilotus alba
,, Brown ...	Trifolium spadiceum
,, Buffalo...	,, reflexum
,, Cabul ...	Melilotus alba
,, Carnation	Trifolium incarnatum
,, Chili ...	Desmodium uncinatum
,, Hop ...	Trifolium agrarium
,, Hungarian	,, Pannonicum
,, Japan ...	Lespedeza striata
,, Mayad ...	Trifolium subrotundum
,, Ordinary red	,, pratense
,, Ordinary white	,, repens
,, Pale-yellow	,, ochroleucum
,, Pennsylvanian	,, reflexum
,, Red Zigzag	,, medium
,, Soola ...	Hedysarum coronarium
,, Strawberry	Trifolium resupinatum
,, Yellow...	,, agrarium
Cola- or Kola-tree	Cola acuminata
Coapim-grass	Panicum spectabile
Coapinole ...	Hymenœa Courbaril
Coca ..	Erythroxylon Coca
Cocksfoot-grass	Dactylis glomerata
Cockshead-plant	Onobrychis sativa
Cockshin-grass	Panicum Crus Galli
Cockspur-Thorn	Cratægus Crus Galli
Coffee-plant ...	Coffea Arabica
Cohosh ...	Cimicifuga racemosa
,, Blue...	Leontice thalictroides
Coigue ..	Fagus Dombeyi
Coihue ..	,, ,,
Colic-root ..	Aletris farinosa
Colocynth ...	Cucumis Colocynthis
Colorado Bottom-grass	Panicum Texanum
Columbia-bark	Cinchona Calisaya
Colza ...	Brassica oleracea
Comfrey ...	Symphytum officinale
Congo-Pea ...	Cajanus Indicus
Copal, Mexican	Bursera elemifera
,, West-Indian	Hymenæa Courbaril
Copique ...	Lapageria rosea
Coquito-Palm	Jubæa spectabilis
Cord-grass ...	Spartina stricta
Cork-Oak ...	Quercus Suber
Corkwood-tree	Sesbania grandiflora
Cotton, Tree	Gossypium arboreum
,, Salt-bush	Kochia villosa
Cottonwood-tree	Populus monilifera
Couch-grass, Indian	Cynodon Dactylon
Courbaril ...	Hymenæa Courbaril
Coyam ...	Fagus obliqua
Crab-Apple ...	Pyrus coronaria
Crab-grass ...	Panicum sanguinale
Cranberry-bush	Vaccinium macrocarpon
Cress, Scurvy	Cochlearia officinalis
,, Real ...	Lepidium sativum
,, Climbing	Tropæolum majus
,, Para ...	Spilanthes oleracea
Crosnes ...	Stachys tuberifera
Cuba-grass ...	Andropogon Halepensis
Cucumber ...	Cucumis sativa
Cuji-tree ...	Acacia macrantha
Culver's Root	Veronica Virginica
Cumin ...	Cuminum Cyminum
Curly palm ...	Kentia Belmoreana
Currant, Grape	Vitis vinifera, var.
,, Black	Ribes nigrum
,, Red	,, rubrum
Curryong ...	Brachychiton populneus
Cusha ...	Andropogon Calamus
Chusan-Palm	Chamærops excelsa
Custard-tree...	Anona Cherimolia
Cutch ...	Acacia Catechu
Cypress, Bald	Taxodium distichum
,, Common	Cupressus sempervirens
,, Montezuma	Taxodium mucronatum
,, Swamp	,, distichum
,, Yellow	Thuya gigantea
Dammar-tree	Dammara alba
Damson-tree	Prunus domestica
Danchi ...	Sesbania aculeata
Date-Palm ...	Phœnix dactylifera
Date-Plum ...	Diospyros Kaki
Deadly Night-shade	Atropa Belladonna

INDEX TO VERNACULAR NAMES—*continued.*

Deccan-grass	Panicum frumentaceum
Dewberry-Bramble	Rubus Canadensis
Dhak ...	Butea frondosa
Dhaman ...	Pennisetum cenchroides
Dill	Peucadanum graveolens
Dita-tree ...	Alstonia scholaris
Divi-Divi ...	Cæsalpinia coriaria
Doab-grass	Cynodon Dactylon
Dochna ...	Andropogon saccharatus
Dogstail-grass	Cynosurus cristatus
Dogwood-tree	Cornus florida
„ Jamaica	Piscidia erythrina
Doornboom ...	Acacia horrida
Doorva-grass	Cynodon Dactylon
Doum-Palm ...	Hyphæne crinita
Dragonsblood-tree	Dracæna Draco
Drooping Gum-tree	Eucalyptus pauciflora
Durra ...	Andropogon saccharatus
„ ...	„ sorghum
Dwarf Fan-Palm	Chamærops humilis
Dyer's Woad	Isatis tinctoria
Earth-Chestnut	Conopodium denudatum
Earth-Nut ...	Arachis hypogæa
Earth-Pea ..	Voandzeia subterranea
Ebony ...	Diospyros Ebenum
„ American	„ Virginiana
„ Australian	Maba geminata
Egg-plant ...	Solanum Melongena
Elder ..	Sambucus niger
Elecampane ...	Inula Helenium
Elemi ...	Bursera elemifera
Elm, Indian ..	Holoptelea integrifolia
„ White ...	Ulmus Americana
„ British ..	„ campestris
„ Whahoo	„ alata
Esparsette ...	Onobrychis sativa
Esparto ...	Stipa tenacissima
Espino ...	Acacia Cavenia
Estragon ...	Artemisia Dracunculus
Feijdospretos	Phaseolus lunatus
Fenkelwortel	Carum Capense
Fennel ...	Fœniculum officinale
Fern, sweet ...	Comptonia asplenifolia
Fernambuc-wood	Cæsalpinia echinata
Fescue, Meadow	Festuca elatior
„ Sheep	„ ovina
Feverfew ...	Chrysanthemum parthenium
Fichte ...	Pinus picea
Figtree ...	Ficus Carica
Fi-Moro ..	Thuya orientalis
Fiorin-grass...	Agrostis palustris
Fir, Balm of Gilead	Pinus balsamea
„ Balsam ...	„ „
„ Cilician ...	„ Cilicica
„ Double Balsam	„ Fraseri
„ Great Silver	„ grandis
„ Noble White	„ nobilis
„ Oyamel ...	„ religiosa
„ Red ...	„ nobilis
„ Sapindus	„ orientalis
„ Scotch ...	„ silvestris
„ Siberian Pitch	„ Sibirica
„ Spanish...	.. Pinsapo
„ Umbrella	Sciadopitys verticillata
„ Veitch's	Pinus selenolepis
„ Yellow ...	„ grandis
Firethorn ...	Cratægus pyracantha
Flametree ...	Brachychiton acerifolius
Flax ..	Linum usitatissimum
Flax-Lily, New Zealand	Phormium tenax
Flooded Gum-tree	Eucalyptus saligna
Flowering Rush	Butomus umbellatus
Fluted Gum-tree	Eucalyptus salubris
„	„ tereticornis
Foehre ..	Pinus silvestris
Foxglove ...	Digitalis purpurea
Foxtail-grass	Alopecurus pratensis
Fugi ...	Wistaria Chinensis
Fuller's Herb	Saponaria officinalis
„ Teazel	Dipsacus fullonum
Furze ...	Ulex Europæus
Galingale Mat Rush	Cyperus tegetum
Gama-grass ...	Tripsacum dactyloides
Gamboge ...	Garcinia Xanthochymus
Garlic ...	Allium sativum
Genipi ...	Achillea moschata
„ ...	Artemisia Mutellina
Gentian ...	Gentiana lutea
Giant Gumtree	Eucalyptus amygdalina
Gimlet-wood	Eucalyptus salubris
Ginger ...	Zingiber officinale
Ginger-grass	Andropogon Calamus

INDEX TO VERNACULAR NAMES—*continued.*

Gingerbread-Palm	Hyphæne crinita
Ginkgo-tree	Ginkgo biloba
Gingili	Sesamum Indicum
Ginseng-root	Aralia Ginseng
Golden Seal	Hydrastis Canadensis
Gooseberry-bush	Ribes Grossularia
Gooseberry,	
„ Barbadoes	Peireskia aculeata
„ Cape	Physalis Peruviana
„ Currant	Ribes oxycanthoides
„ Tomato	Physalis pubescens
Gorse	Ulex Europæus
Goumi	Elæagnus longipes
Gourd	Cucurbita maxima
„	„ moschata
„	„ Pepo
Gram	Cicer arietinum
„ Horse	Dolichos uniflorus
„ Green	Phaseolus Max
Gramma-grass	Bouteloua polystachya
Granadilla	Passiflora, several
Grape, Fox	Vitis vulpina
„ Frost	„ cordifolia
„ Isabella	„ Labrusca
„ Muscadine	„ vulpina
„ Mustang	„ candicans
„ ordinary	„ vinifera
„ Sand	„ rupestris
„ Summer	„ æstivalis
„ Winter	„ cordifolia
Grape-Pear	Amelanchier Botryapium
Grape-Vine	Vitis vinifera
Green River-grass	Panicum Texanum
Grass-trees	Xanthorrhœa, several
Grey Gumtree	Eucalyptus Raveretiana
Ground-Almond	Cyperus esculentus
Ground-Nut	Arachis hypogæa
Ground-Ivy	Nepeta Glechoma
Guabiroba	Psidium chrysophyllum
Guaco	Aristolochia ovalifolia
Guango	Albizzia Saman
Guaparanga	Marliera tomentosa
Guar	Cyamopsis psoraloides
Guarana	Paulinia sorbilis
Guava	Psidium Guayava
„ Chilian	Myrtus Ugni
„ Purple	Psidium Cattleyanum
Guinea-corn	Andropogon cernuus
„ „	„ Sorghum
Guinea-grass	Panicum maximum
Gumbo	Hibiscus esculentus
Gunyang	Solanum vescum
Guttapercha-tree	Palaquium, several
Gutta Taban	„ „
Habhel	Juniperus drupacea
Hackberry-tree	Celtis occidentalis
Hack-me-tack	Pinus contorta
Hair-grass	Agrostis scabra
Haleppo-grass	Andropogon Halepensis
Hamat Kochata	Astragalus venosus
Haricot	Phaseolus vulgaris
Haw, Apple	Cratægus æstivalis
„ Black	Viburnum prunifolium
Hawthorn	Cratægus oxyacantha
Hazel	Corylus, several
„ Chili	Guevina Avellana
Heliotrope	Heliotropium Peruvianum
Hemlock	Conium maculatum
„ Spruce	Pinus Canadensis
Hemp	Cannabis sativa
„ Sunn	Crotalaria juncea
Henbane	Hyoscyamus niger
Henequen	Agave rigida
Henna-bush	Lawsonia alba
Henoki	Celtis Sinensis
Herd-grass	Agrostis palustris
Hickory-trees	Carya, several
Hickory-Eucalypt	Eucalyptus punctata
Hinoki	Cupressus obtusa
Hognut-tree	Carya glabra
Holly	Ilex Aquifolium
Holly-oak	Quercus Ilex
Honey-Locust	Gleditschia triacanthos
Hoop-koop	Lespedeza striata
Hop	Humulus Lupulus
Hop-Hornbean	Ostrya carpinifolia
Horehound	Marrubium vulgare
Hornbeam	Carpinus Betulus
Horse-Chestnut tree	Æsculus Hippocastanum
Horse-Gram	Dolichos uniflorus
Horse-radish	Cochlearia armoracia
„ tree	Moringa pterygosperma
„ Kerguelen	Pringlea antiscorbutica
Horseshoe-Vetch	Hippocrepis comosa
Hottentot-Fig	Mesembrianthemum edule
Huahuoa	Laurelia aromatica
Huanuco-bark	Cinchona nitida
Huckleberry-shrub	Vaccinium corymbosum

INDEX TO VERNACULAR NAMES—*continued.*

Huon-pine ... Dacrydium Franklini

Iceland-moss Cetraria Islandica
Ice-plant ... Mesembrianthemum
Imekomatsou Pinus parviflora
Imphee ... Andropogon Sorghum
Indian Bread Pachyma Cocos
Indian Corn Zea Mays
Indian Fig-Cactus Opuntia Ficus Indica
India-Rubber-tree Ficus elastica
Indigo, Canadian Baptisia tinctoria
„ true ... Indigofera tinctoria
„ Japan Polygonum tinctorium
Inoumaki ... Nageia macrophylla
Ipecacuanha... Cephaelis Ipecacuanha
Ironbark-Acacia Acacia excelsa
Ironbark-trees Eucalyptus crebra
„ „ „ Leucoxylon
„ „ „ melanophloia
„ „ „ paniculata
„ „ „ siderophloia
Iron-Gumtree Eucalyptus Raveretiana
Ironwood ... Carpinus Americana
„ Acacia Acacia stenophylla
Iva ... ... Achillea moschata
Ivy ... ... Hedera Helix
Ixtli-fibre ... Agave heteracantha
Jaborandi ... Pilocarpus pinnatifolius
Jacaranda-wood Dalbergia nigra
Jack-tree ... Artocarpus integrifolia
Jalap .. Ipomœa purga
Janatsi-itsigo Debregeasia edulis
Jarilla ... Adesmia balsamica
Jarosse ... Lathyrus sativus
Jarrah ... Eucalyptus marginata
Jasmine ... Jasminum, several
„ medicinal Gelsemium nitidum
Job's Tears ... Coix Lachryma
Johnstone-grass Andropogon Halepensis
Jujuba ... Zizyphus jujuba
Juneberry-tree Amelanchier Botryapium
Jute-plant ... Corchorus olitorius

Kaawi-Yam ... Dioscorea aculeata
Kafta ... Catha edulis
Kahikatea ... Nageia dacrydioides
Kail or Kale... Brassica oleracea
„ Sea Crambe maritima
Kamala Mallotus Philippinensis
Kamassi-wood Gonioma Kamassi
Kane Matau... Sciadopitys verticillata
Kangaroo-grass Anthistiria ciliata
Kangaroo-thorn Acacia armata
Karaka ... Corynocarpus lævigatus
Karamatsou ... Pinus leptolepis
Karra-Doorn Acacia horrida
Karri ... Eucalyptus diversicolor
Kashi ... Quercus glauca
Kauri-Pine ... Dammara Australis
Kau-sun ... Zizania latifolia
Kaya ... Torreya grandis
Keaki ... Zelkovia acuminata
Kei-Apple bush Aberia Caffra
Kermes-Oak ... Quercus coccifera
Kentucky Blue-grass Poa pratensis
Kidney-vetch Anthyllis vulneraria
Kikar ... Acacia Arabica
Kohlrabi ... Brassica oleracea
Koho-Khur ... Hydnum coralloides
Kolkas ... Colocasia esculenta
Kooya-Maki ... Sciadapitys verticillata
Kouromatsou Pinus Thunbergi
Kumquat ... Citrus Japonica
Kuskus ... Andropogon muricatus

Ladanum-bush Cistus Creticus
Lahual ... Nageia Chiliana
Lalong-grass Imperata arundinacea
Lamb's Lettuce Valerianella olitoria
Larch, American Pinus pendula
„ Black ... „ „
„ Chinese „ Kæmpferi
„ Common „ Larix
„ Himalayan „ Griffithii
„ Japan ... „ leptolepsis
„ Oregon ... „ Nuttalli
Laubick-grains Vigna Sinensis
Laurel, Cherry Umbellularia Californica
Mountain
„ Spice ... Lindera Benzoin
„ Warriors Laurus nobilis
Lauristine ... Viburnum Tinus
Lavender ... Lavandula angustifolia
Leatherjacket Eucalyptus punctata
Leek ... Allium Porrum
„ British ... Allium Ampeloprasum
Lemon ... Citrus Medica
„ Desert... Atalantia glauca
Leng ... Trapa bicornis
Lentil ... Ervum Lens
Lettuce ... Lactuca sativa
Lever-wood ... Ostrya Virginica
Lightwood ... Acacia Melanoxylon

INDEX TO VERNACULAR NAMES—*continued.*

Lilac ... Syringa vulgaris
Lily of the Valley ... Convallaria majalis
Lima-Bean ... Phaseolus lunatus
Lime ... Citrus medica
Linden-tree ... Tilia alba
Ling ... Trapa bicornis
Links ... „ „
Liquorice ... Glycyrrhiza glabra
Litchi ... Nephelium Litchi
Litmus ... Roccella tinctoria
Litre ... Rhus caustica
Lleuque ... Nageia andina
Loblolly-Bay Gordonia Lasianthus
Loco-weed ... Astragalus, several
Locust-Acacia Robinia Pseudacacia
Locust-tree ... Gleditschia triacanthos
Log-wood ... Hæmatoxylon Campechianum
Longan ... Nephelium Longanum
Loongur ... Carex Moorcroftiana
Loquat ... Photinia eriobotrya
Lotus ... Nelumbo nucifera
Lotus-tree ... Celtis Australis
Loxa-bark ... Cinchona nitida
Lucerne ... Medicago sativa
Lupines ... Lupinus, several

Madder ... Rubia tinctoria
Mahin ... Saxono-Gothaea conspicua
Mahogany-tree Swietenia Mahagoni
„ Bastard Eucalyptus botryoides
„ Red ... „ resinifera
„ Swamp „ robusta
„ West-Australian „ marginata
„ White „ triantha
Mahwa ... Illippe latifolia
Maize ... Zea Mays
Mallamak ... Ipomœa graminea
Mallee ... Eucalyptus, several
Mammoth-tree Sequoia Wellingtonia
Mandrake, American Podophyllum peltatum
Mangaihas ... Hancornia speciosa
Mango-tree ... Mangifera Indica
Mangold-root Beta vulgaris
Manilla-hemp Musa textilis
Manna-grass ... Poa fluitans
Manna-Gumtree Eucalyptus viminalis
Manniu ... Nageia Chiliana
Maple ... Acer
„ Norway „ platanoides
„ Oregon, large „ macrophyllum
Maple Red ... „ rubrum
„ Silver ... „ dasycarpum
„ Sugar or Rock „ saccharinum
„ Sycamore „ Pseudo Platanus
Marjoram ... Origanum Majorana
Marmelade-tree Achras Sapota
Marmeladinha Alibertia edulis
Marrem ... Psamma arenaria
Marsh-Mallow Althæa officinalis
Mastic-tree ... Pistacia Lentiscus
Matai ... Heleocharis tuberosa
Mate ... Ilex Paraguensis
Matsou ... Pinus Thunbergii
May-Pops ... Passiflora incarnata
Meadow-Fescue Festuca elatior
„ Foxtail-grass Alopecurus pratensis
„ Oatgrass Avena pratensis
Meadow-grass Poa pratensis
„ tall Avena elatior
Meadow-Pea ... Lathyrus pratensis
Meadow-Saffron Colchicum autumnale
Medick ... Medicago lupulina
Medlar ... Pyrus Germanica
„ Welsh ... Cratægus Azarolus
Mekka Balsam-tree Balsamodendron opobalsamum
Melon ... Cucumis Melo
Mesquite ... Prosopis dulcis
Mesquite-grass Panicum obtusum
Messmate-tree Eucalyptus obliqua
Metake ... Arundinaria Japonica
Mignonette ... Reseda odorata
Millet ... Panicum miliaceum
„ Pearl ... Pennisetum thyphoideum
„ Indian ... Andropogon Sorghum
„ Sugar ... „ saccharatus
Millet-grass ... Milium effusum
Millfoil ... Achillea Millefolium
Mint, Australian Mentha laxiflora
„ Pepper ... „ piperita
„ Crisp ... „ rotundifolia
„ Spear ... „ viridis
„ Cat ... Nepeta Cataria
„ Mountain Pycnanthemum montanum
„ spurious Monarda punctata
Miro ... Nageia ferruginea
Mitchell-grass Astrebla pectinata
Mocker-nut tree Carya tomentosa
Molle ... Duvaua longifolia
Monk's Hood Aconitum Nepellus
Moram ... Psamma arenaria
Morel ... Morchella conica

INDEX TO VERNACULAR NAMES—*continued.*

Moreton-Bay Ash	Eucalyptus tessellaris
„ Fig	Ficus macrophylla
Morrell ...	Eucalyptus oleosa
Mortina ...	Vaccinium Mortinia
Mezquite-grass	Panicum obtusum
Moss, Florida Mattress	Tillandsia usneoides
MosscuppedOak	Quercus Cerris
Mountain-Ash	Pyrus aucuparia
Muermo ...	Eucryphia cordifolia
Mulberry-trees	Morus, several
Mulga-grass	Neurachne Mitchelliana
„ tree ...	Acacia aneura
Mullein ...	Verbascum Thapsus
Muntrie ...	Kunzea pomifera
Mustard, Black	Brassica nigra
„ White	„ alba
Myall-trees ...	Acacia acuminata
„ „ ...	„ glaucescens
„ „ ...	„ homalophylla
„ Weeping	„ pendula
Myrobalan-tree	Terminalia Chebula
Myrrh-tree ...	Balsamodendron Myrrha
Myrtle ...	Myrtus communis
Nasturtium ...	Tropæolum majus
Navew ...	Brassica oleracea
Nectarine-tree	Prunus Persica
Neem-tree ...	Melia Azadirachta
Neroli-tree ...	Citrus Aurantium
Ngaio ...	Myoporum lætum
Nika-Palm ...	Kentia sapida
Ningal-Bamboo	Arundinaria spathiflora
Nonda-tree ...	Parinarium Nonda
Norfolk-Island Palm	Kentia Baueri
„ Pine	Araucaria excelsa
Notra ...	Embothrium coccineum
Nuble ...	Adenostemum nitidum
Nut, Brazil ...	Bertholletia excelsa
„ Hazel ...	Corylus, several
Nut-Pine, Nepal	Pinus Gerardiana
Nut-tree, Australian	Macadamia ternifolia
Oak ...	Quercus, many
„ Abraham's	„ Calliprinos
„ Live ...	„ virens
„ Rock Chestnut	„ Prinus
„ Zeen ...	„ infectoria
„ Chestnut, Oregon	Castanopsis chrysophylla
Oat-grass ...	Avena elatior
„ ...	„ pubescens
„ ...	„ fatua
„ ...	„ flavescens
„ ...	„ pratensis
Oats ...	Avena sativa
Ohelo ...	Vaccinium pendulifiorum
Okra ...	Hibiscus esculentus
Olibanum-trees	Boswellia, several
Olive-tree ...	Olea Europæa
Ombu ...	Pircunia dioica
Onion ..	Allium Cepa
„ Welsh ...	„ fistulosum
Ooyala-Yam...	Dioscorea tomentosa
Orange-tree ...	Citrus Aurantium
Orchard-grass	Dactylis glomerata
Orchil ...	Roccella tinctoria
Oregon-Larch	Pinus Nuttalli
„ Red Cedar	Thuya gigantea
Orris-root ...	Iris Florentina
Orseille ...	Roccella tinctoria
Osage-Orange	Maclura aurantiaca
Osiers ...	Salix, several
Oswego-Tea plant	Monarda didyma
Overcup-Oak	Quercus lyrata
Oyster-Mushroom	Agaricus ostreatus
Pa-Koo ...	Ginkgo biloba
Palisander-tree	Dalbergia nigra
Palixander-tree	Jacaranda mimosifolia
Palmetto, Blue	Rhapidophyllum Hystrix
„ Dwarf ...	Sabal Adansoni
Palm-Lillies...	Cordyline, several
Palmyra ...	Borassus flabelliformis
Palta ...	Persea gratissima
Pampas-grass	Arundo Sellowiana
Pampelmos ...	Citrus Aurantium, var
Papaw-tree ...	Carica Papaya
Paper-Mulberry	Broussonetia papyrifera
Papoose-plant	Leontice thalictroides
Papyrus ...	Cyperus Papyrus
„ Dwarf	„ Syriacus
Para-grass ...	Panicum barbinode
Parsimon ...	Diospyros, several
Parsley ...	Carum Petroselinum
Parsnip ...	Peucadanum sativum
Parsnip-Chervil	Chærophyllum bulbosum
Passion-flower	Passiflora, several
Patchouli ...	Pogostemon Patchouli
Pea, common...	Pisum sativum
„ Congo ...	Cajanus Indicus

INDEX TO VERNACULAR NAMES—*continued.*

Pea, Cow ... Vigna Sinensis
Pea-Bush ... Sesbania Ægyptiaca
Pea-nut ... Arachis hypogæa
Pea-tree ... Caragana arborescens
Peach-tree ... Prunus Persica
Peach-Palm .. Bactris Gasipæs
Pear ... Pyrus communis
„ prickly ... Opuntia, several
„ snow ... Pyrus nivalis
Pearl-grass ... Melica nutans
Pecannut-tree Carya oliviformis
Pelu ... Sophora tetraptera
Pencil-cedar... Juniperus Bermudiana
Pennyroyal ... Mentha Pulegium
Pennsylvania green grass Poa pratensis
Pepino ... Solanum muricatum
Pepperidge ... Nyssa aquatica
Peppermint ... Mentha piperita
„ Eucalypt Eucalyptus, several
Persimmon ... Diospyros, several
Perubark-trees Cinchona, several
Petsi ... Heleocharis tuberosa
Phillips-Grass Andropogon Halepensis
Pin-Oak ... Pinus palustris
Pine, Aleppo „ Halepensis
„ American Pitch „ flexilis
„ American White „ „
„ Bastard... „ Cubensis
„ Bishop's „ muricata
„ Black, N.Z. Nageia spicata
„ Bootan ... Pinus excelsa
„ Brazilian Araucaria Brasiliensis
„ Broom ... Pinus Australis
„ Bull ... „ flexilis
„ Canary ... „ Canariensis
„ Celery ... Phyllocladus trichomanoides
„ Cheer ... Pinus longifolia
„ Cluster ... „ Pinaster
„ Corsican.. „ Laricio
„ Dye ... „ Webbiana
„ Emodi ... „ longifolia
„ Foxtail ... „ Balfouriana
„ Frankincense „ Tæda
„ Georgia... „ Australis
„ Giant ... „ Lambertiana
„ Ginger ... Cupressus fragrans
„ Golden ... Pinus Kæmpferi
„ Grey ... „ Hudsoniana
„ Hard ... „ Australis
„ Hickory... „ Balfouriana
„ Huon ... Dacrydium Franklini
„ Jersey ... Pinus inops
Pine, Kauri ... Dammara Australis
„ King ... Pinus Webbiana
„ Loblolly „ Tæda
„ Long-leaved yellow „ Australis
„ Mahogany Nageia Totara
„ Mexican Swamp Pinus cembroides
„ Moreton-Bay Araucaria Cunninghami
„ Norfolk-Island „ excelsa
„ Nut, Himalayan Pinus Gerardiana
„ Nut, Californian „ monophylla
„ Nut, Rocky Mountain „ Sabiniana
„ Okote ... „ Teocote
„ Oregon ... „ Douglasi
„ Pitch ... „ rigida
„ „ Yellow „ Australis
„ „ „ „ ponderosa
„ Pond ... „ serotina
„ Red, New Zealand Dacrydium cupressinum
„ Red, American Pinus resinosa
„ Scotch ... „ silvestris
„ Screw ... Pandanus, several
„ Shake ... Pinus Lambertiana
„ Short-leaved „ mitis
„ Slash ... „ Cubensis
„ Southern „ Australis
„ Stone ... „ pinea
„ Sugar ... „ Lambertiana
„ Swamp ... „ Cubensis
„ Torch ... „ Teocote
„ Trucker „ ponderosa
„ Weymouth „ Strobus
„ White ... „ Strobus
„ White, Californian Pinus Sabiniana
„ White, „ flexilis Western
„ White, New Zealand Nageia dacrydioides
„ Yellow, Puget Sound Pinus Douglasi
„ Yellow, Eastern „ mitis
„ Yellow Pitch, Western „ ponderosa
„ Yellow Pitch, Southern „ Australis
„ Zirbel ... „ Cembra
Pineapple-plant Ananas sativa.

INDEX TO VERNACUAR NAMES—*continued.*

Pine-Palm ...	Cycas, several
Pinkroot ...	Spigelia Marylandica
Pino-nut tree	Pinus edulis
Piquillin-bush	Condalia microphylla
Pisang ...	Musa paradisiaca
Pistacia-nut tree	Pistacia vera
Pita fibre-plant	Agave Mexicana
Pitaya-bark ...	Cinchona officinalis
Pitury ...	Duboisia Hopwoodii
Plane-tree ...	Platanus, several
,, spurious	Acer Pseudo-Platanus
Plantain ...	Musa paradisiaca
Plum-tree ...	Prunus domestica
,, Californian	Prunus subcordata
,, Japanese	Prunus Japonica
,, Juniper	Juniperus drupacea
Pocoon ...	Hydrastis Canadensis
Pomegranate	Punica Granatum
Pomelloe ...	Citrus Medica
Pompelmos ...	,, decumana
Pompion ...	Cucurbita maxima
Poplars ...	Populus, several
Poppy ...	Papaver somniferum
Potato ...	Solanum tuberosum
Prairie-grass, Southern	Bromus unioloides
Prairie-grass, Eastern	Spartina cynosuroides
Prairie-turnip	Psoralea esculenta
Praong ...	Arundinaria Hookeriana
Prickly Pear	Opuntia, several
Pride of Barbadoes	Cæsalpinia pulcherrima
Pride of India	Melia Azedarach
Privet ...	Ligustrum vulgare
Prune-tree ...	Prunus domestica
Puccon ...	Hydrastis Canadensis
Puchero ...	Talinum patens
Puff-Ball ...	Lycoperdon and Bovista, several
Pulas ...	Butea frondosa
Pulque ..	Agave Americana
Pumpkin ...	Cucurbita Pepo
Putchuk ...	Aristolochia recurvilabra
Pyengadu ...	Xylia dolabriformis
Pythagorean Bean	Nelumbo nucifera
Quamash ...	Scilla Fraseri
Quandong ...	Santalum acuminatum
Quannot-tree	Acacia heteroclita
Quebracho ...	Aspidosperma Quebracho
,, Colorado	Loxopterygium Lorentzi
Queen of the Meadows	Eupatorium purpureum
Quercitron ...	Quercus coccinea
Querule ...	Adenostemum nitidum
Quick ...	Cratægus oxyacantha
Quince ...	Pyrus Cydonia
Quincherich	Silene Cucubalus
Quinine-tree	Cinchona, several
Radish ...	Raphanus sativus
Rain-tree ...	Albizzia Saman
Rambutan ...	Nephelium lappaceum
Ramee ...	Boehmeria nivea
Rampion ...	Campanula Rapunculus
Rampostan ...	Nephelium lappaceum
Rancouran ...	Owenia venosa
Rantiloil-plant	Guizotia oleifera
Raps ...	Brassica oleracea
Raspberry-bush	Rubus Idaeus
Rata ...	Metrosideros, several
Ratanhia-shrub	Krameria triandra
Rattlesnake-grass	Poa Canadensis
Rauli ...	Fagus procera
Red Brazil-wood	Cæsalpinia echinata
Red Cedar ...	Cedrela, several
Red Gum-tree	Eucalyptus calophylla
,, ,, ...	,, rostrata
,, ,, ...	,, tereticornis
Red Mahogony	Eucalyptus resinifera
Red Pine, New Zealand	Dacrydium cupressinum
Red Sandal-wood	Pterocarpus Marsupium
Redtop-grass	Agrostis rubra
,, tall	Festuca flava
Redwood-Cedar	Sequoia sempervirens
Reedmace ...	Typha latifolia
Reule ...	Fagus procera
Rewa-Rewa ...	Knightia excelsa
Rheea ...	Boehmeria nivea
Rhubarb ...	Rheum, several
Rib-herb ...	Plantago lanceolata
Rice ...	Oryza sativa
Rice, Canada	Zizania aquatica
Ricepaper-plant	Fatsia papyrifera
Rimu ...	Dacrydium cupressinum
Ringal ...	Arundinaria spathiflora
Roble, Chilian	Fagus obliqua
,, Californian	Quercus lobata
Romerillo ...	Heterothalamus bruniioides
Rose-Apple ...	Eugenia Malaccensis

INDEX TO VERNACULAR NAMES—*continued.*

Roses	Rosa, many
Rosemary	Rosmarinus officinalis
Rosewood	Convolvulus floridus
Rowan-tree	Pyrus aucuparia
Root, Broom-	Epicampes macroura
Rubber-trees	Ficus elastica
„	Hevea Guianensis
„	Castilloa elastica
Rue	Ruta graveolens
Rye	Secale cereale
Rye-grass	Lolium perenne
Sabadilla	Schoenocaulon officinale
Sabe	Andropogon involutus
Sacci	Agave rigida
Safflower	Carthamus tinctorius
Saffron	Crocus sativus
Sage, Black	Trichostema lanatum
„ Garden	Salvia officinalis
Sainfoin	Onobrychis sativa
Sakura	Prunus Pseudo-Cerasus
Salad-Burnet	Sanguisorba minor
Sallow	Salix caprea
Salmonbarked Gumtree	Eucalyptus salmonophloia
Salsify	Trogopogonporrifolius
Saltbush, Australian	Atriplex, several
„	Rhagodia „
„	Kochia „
„ South African	Exomis axyroides
Sal-tree	Shorea robusta
Sambul	Ferula Sambul
Samphire	Crithmum maritimum
Sandal-trees	Santalum, several
Sandarac-tree	Callitris, several
Sand-Leek	Allium Scorodoprasum
Sandstay	Leptospermum lævigatum
Sapodilla-Plum	Achras Sapota
Sarsaparilla	Smilax, several
Sassafras-tree	Sassafras officinale
Satinwood	Chloroxylon Swietenia
Savara	Cupressus pisifera
Savory, Winter	Satureja montana
„ Summer	„ hortensis
„ Thyme	„ Thymbra
Scammonia-plant	Convolvulus Scammonia
Scarlet Runner	Phaseolus coccineus
Scented Vernal-grass	Anthoxanthum odoratum
Schamum	Spinacia tetrandra
Scorzonera	Scorzonera Hispanica
„ Australian	Microseris Forsteri
Scotino	Rhus Cotinus
Screw-Pine	Pandanus furcatus
Sea-Kail	Crambe maritima
Sea-Lyme-grass	Elymus arenarius
Senna	Cassia acutifolia
Seratella	Ornithopus sativus
Serradella	„ „
Shadbush	Amelanchier Botryapium
Shaddock	Citrus Aurantium, var
Shallot	Allium Ascalonicum
Shamalo	Panicum frumentaceum
Sheep-Fescue	Festuca ovina
She Oak, drooping	Casuarina quadrivalvis
„ erect	„ suberosa
Silt-grass	Paspalum distichum
Silver-Fir	Pinus Abies
„ Californian	„ amabilis
„ Cilician	„ Cilicica
„ Great	„ grandis
„ Great White	„ concolor
Silver-tree	Leucadendron argenteum
Silvery Tree-Fern	Cyathea dealbata
Simibi-Bean	Phaseolus aconitifolius
Singhara-Nut	Trapa bispinosa
Siris-Acacia	Albizzia Lebbek
Sisal-Hemp	Agave rigida
Sisso-tree	Dalbergia Sisso
Sloe	Prunus spinosa
Snail-Clover	Medicago scutellata
Snake-root	Aristolochia serpentaria
„	Cimicifuga racemosa
„	Liatris odoratissima
„	Polygala Senega
Soapwort	Saponaria officinalis
Soffar	Acacia Seyal
Softgrass	Holcus lanatus
„	„ mollis
Soja	Glycine hispida
Solah	Æschynomene aspera
Soola-Clover	Hedysarum coronarium
Soom-tree	Machilus odoratissima
Sorrel, French	Rumex scutatus
„ Kitchen	„ acetosa
„ Wood	Oxalis, several
Soulchir	Agriophyllum Gobicum
Sour Gumtree	Nyssa multiflora
Sour Plum	Owenia venosa

INDEX TO VERNACULAR NAMES—*continued.*

Sour Sop ...	Anona muricata
Southernwood	Artemisia Abrotanum
Spadic ...	Erythroxylon Coca
Spearwood ...	Eucalyptus doratoxylon
Speik ...	Valeriana Celtica
Speckboom ...	Portulacaria Afra
Spikenard ...	Nardostachys Jatamansi
Spinage ...	Spinacia oleracea
„ New Zealand	Tetragonia expansa
Spotted Gum-tree	Eucalyptus goniocalyx
„ „	„ maculata
Spruce, Black	Pinus nigra
„ Blue ...	„ Sitkensis
„ Hemlock	„ Canadensis
„ „ Western	„ Mertensiana
„ Kutrow ...	„ Smithiana
„ Norway ...	„ picea
„ Red ...	„ rubra
„ Sapindus	„ orientalis
„ Tideland	„ Sitkensis
„ White ...	„ alba
Spurrey ...	Spergula arvensis
Squash ...	Cucurbita Melopepo
Squill ...	Urginea Scilla
Squirting Cucumber	Ecbalium Elaterium
Star-Anise ...	Illicium verum
Stone-root ...	Collinsonia Canadensis
Storax-tree ...	Liquidambar orientalis
Strawberry-plants	Fragraria, several
Strawberry-Tomato	Physalis Alkekengi
Stringybark-trees	Eucalyptus, several
Styrax-tree ...	Styrax officinalis
Suak Gum-Acacia	Acacia stenocarpa
Sugar-Cane ...	Saccharum officinarum
Sugar Gumtree	Eucalyptus corynocalyx
Sugi ...	Cryptomeria Japonica
Sulphur-root	Peucedanum officinale
Sumach ...	Rhus coriaria
„ Staghorn	Rhus typhina
Sunflower ...	Helianthus annuus
„ Artichoke	„ tuberosus
Sunn-Hemp ...	Crotalaria juncea
Sunt ...	Acacia Arabica
Swamp Gumtree	Eucalyptus, several
„ Mahogany	„ robusta
Sweet Bay ...	Laurus nobilis
„ Cane ...	Andropogon Calamus
„ Chervil	Myrrhis odorata
„ Fernbush	Comptonia asplenifolia
„ Flag ...	Acorus Calamus
„ Gale ...	Myrica Californica
„ Potato ...	Ipomœa Batatas
Sweetsop ...	Anona sericea
Switch-grass	Panicum virgatum
Sword-sedge ...	Lepidosperma gladiatum
Sycamore-Fig tree	Ficus Sycamorus
„ Maple	Acer Pseudo Plantanus
Tacamahac ...	Populus balsamifera
Tagasaste ...	Cytisus proliferus
Tahla-Gumtree	Acacia stenocarpa
Talmuda ...	Carum incrassatum
Tallow-tree ...	Excœcaria sebifera
Tamarack ...	Pinus contorta
Tamarak ...	„ pendula
Tamarind ...	Tamarindus Indica
Tambico-plant	Yucca baccata
Tenekaha ...	Phyllocladus trichomanoides
Tangleberry-bush	Gaylussacia frondosa
Tanne ...	Pinus Abies
Tansy ...	Tanacetum vulgare
Tapioca ...	Manihot utilissima
Tare ...	Vicia sativa
„ Lentil ...	„ tetrasperma
Taro ...	Colocasia esculenta
Tata ...	Eugenia supra-axillaris
Tarragon ...	Artemisia Dracunculus
Tea-shrub ...	Camellia Thea
„ „ Paraguay	Ilex, several
Tea of Heaven	Hydrangea Thunbergi
Teak ...	Tectonia grandis
Teazle ...	Dipsacus fullonum
Teff ...	Poa Abyssinica
Teon-itsigo ...	Debregeasia edulis
Teosinte ...	Euchlæna luxurians
Terra Japonica-tree	Acacia Catechu
Tham-Bamboo	Arundinaria falcata
Thimbleberry-bush	Rubus occidentalis
Thorny Bamboo	Bambusa arundinacea
Thyme ...	Thymus vulgaris
Tideland-Spruce	Pinus Sitkensis
Timothy-grass	Phleum pratense
Tivoli-Yam ...	Dioscorea nummularia

LIST OF VERNACULAR NAMES—*continued.*

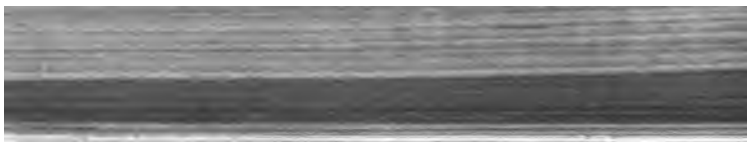
Tobacco	Nicotiana Tabacum
Tochinoki	Æsculus turbinata
Tomato	Solanum Lycopersicum
„ shrub	„ betaceum
Tooart	Eucalyptus gomphocephala
Tornillo	Prosopis pubescens
Tragacanth-plants	Astragalus, several
Tree-Mallow	Lavatera arborea
Trefoil	Trifolium, many
Truffles	Pachyma Cocos
„	Terfezia leonis
„	Tuber, several
Tsougné	Buxus microphylla
Tuberose	Polianthes tuberosa
Tugger	Aquilaria Agallocha
Tule	Sagittaria obtusa
Tulip	Tulipa Gessneriana
Tulip-tree	Liriodendron tulipifera
Tulipwood-tree	Harpullia Hilli
Turmeric	Curcuma longa
Tupelo	Nyssa aquatica
Turkey Oak	Quercus Cerris
Turnips	Brassica oleracea
Turnsoil	Crozophora tinctoria
Turpentine-tree, Chio	Pistacia Terebinthus
Tusca	Acacia moniliformis
Tussock-grass	Poa Forsteri
Ulmo	Eucryphia cordifolia
Umbrella-Fir	Sciadopitys verticillata
„ Palm	Kentia Canterburyana
Unjum	Pennisetum cenchroides
Uvalho do campo	Eugenia pyriformis
Uvi-Yam	Dioscorea alata
Valonia-Oak	Quercus Ægilops
Varnish-tree	Melanorrhœa usitata
Vegetable Marrow	Cucurbita Pepo
Velvet-grass	Holcus lanatus
Verbena, scented	Lippia citriodora
Vernal grass	Anthoxanthum odoratum
Vetch	Vicia sativa
„ hedge	„ sepium
„ forest	sylvatica
Vines	Vitis, many
Vine-Maple	Acer circinatum
Violet	Viola odorata
Vitivert	Andropogon muricatus
Vouvan	Laurelia aromatica
Wallaby-grass	Danthonia penicillata
Walnut, ordinary	Juglans regia
„ black	„ nigra
Wandoo	Eucalyptus redunca
Wapatoo	Sagittaria obtusa
Water-Beech	Carpinus Americana
Water-Chinquepin	Nelumbo lutea
Water-Lily, yellow American	Nuphar multisepalum
Water-Melon	Cucumis Citrullus
Waternut	Trapa natans
Water-whorl-grass	Poa airoides
Wattle, Black	Acacia mollissima
„ Golden	„ pycnantha
„ Silver	„ dealbata
„ Sydney	„ decurrens
Wax-Myrtle	Myrica cerifera
Wax-Palm	Ceroxylon andicola
Wax-Tree, Japan	Rhus succedanea
Weld	Reseda luteola
Whangee	Phyllostachys nigra
Wheat	Triticum vulgare
Whin	Ulex Europæus
White bent-grass	Agrostis palustris
White Gum-tree	Eucalyptus hæmastoma
„ „	„ pauciflora
„ „	„ redunca
„ „	„ several others
White Thorn	Cratægus Oxyacantha
White Thorn, American	„ coccinea
Whortleberry-bush	Vaccinium Myrtillus
Wild Chestnut-tree, Cape	Calodendron Capense
Willow-Oak	Quercus Phellos
„ Myrtle	Agonis flexuosa
Willows	Salix, many
Windmill-grass	Chloris truncata
Winter-cherry	Physalis Alkekengi
Woad	Isatis tinctoria
Wood-Sorrel	Oxalis, many
Woodruff	Asperula odorata
Woollybutt	Eucalyptus longifolia
Wormwood	Artemisia Absinthium
Witch-Hazel	Hamamelis Virginica
Wungee	Cucumis cicatrisatus

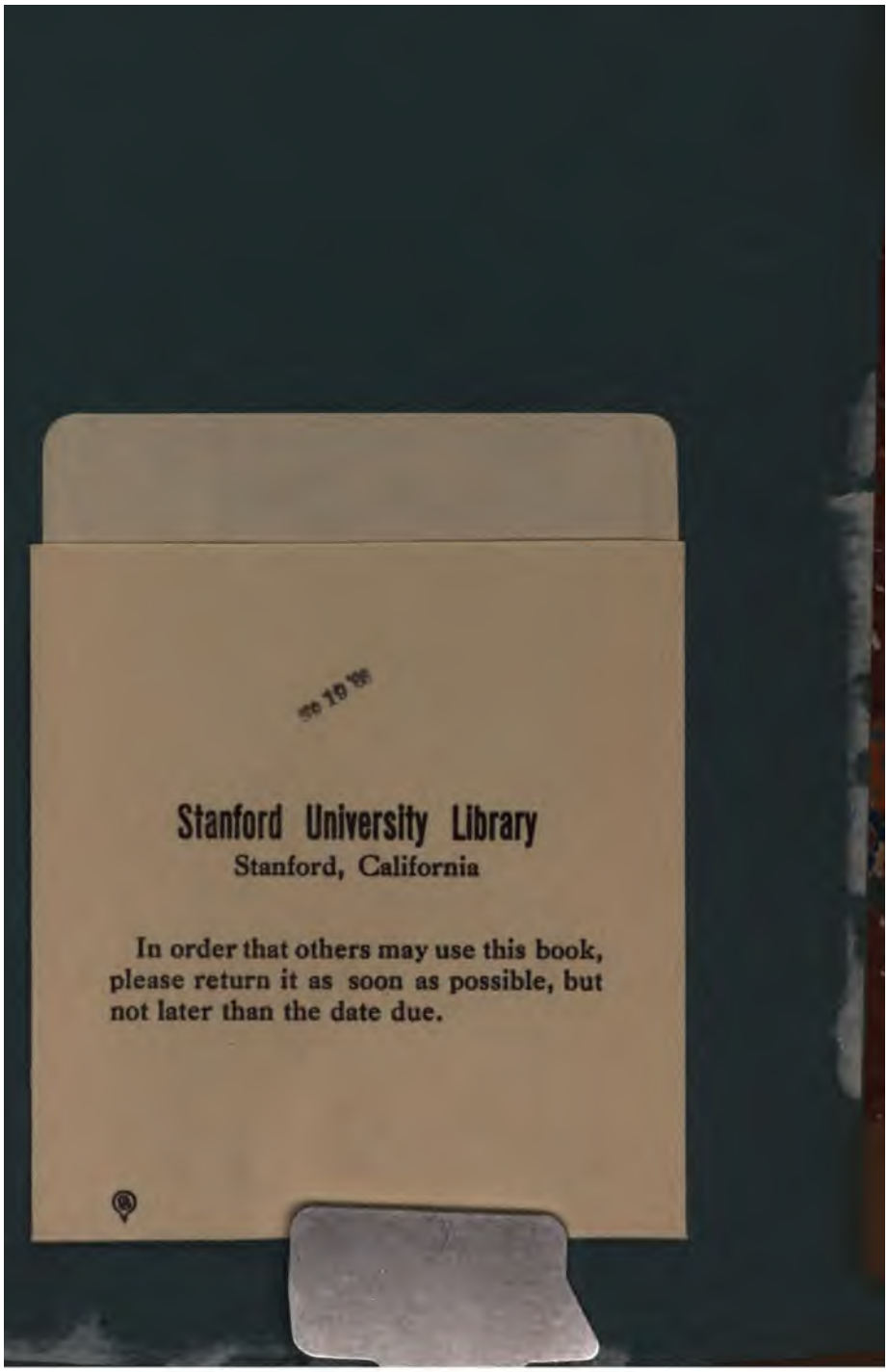
North-American		Zeiosk	... Iris juncea
Yerba Buena	Micromeria Douglasi	Zeen-Oak	... Quercus infec
Yew, British	Taxus baccata	Zwetchen-Baum	Prunus dome

POSTSCRIPT.

In submitting this volume, the writer should feel particularly beholden to recipients, if they would furnish him with such additional reliable notes, as might suggest themselves during the use of this work, and as would be deserving of insertion in a book like this within its own scope. This request is made without reluctance, because the author does not derive any monetary profit from this volume, and also because the fulfilment of the wishes now expressed can involve nowhere much trouble and expense. Moreover, in here treating prominently utilitarian plants of our whole planet, except those of the hottest zone, it needs much aid of locally experienced collaborators in all different regions, if such a publication is to be brought to perfection and to be maintained in such. While approaching the eighth decade of his life, the author cannot hope to see many more editions of this work, brought up to the newest standard, through the press himself; but as he may perhaps still be able to publish one more edition before passing away, he is now particularly eager, that the next issue should by some special efforts be rendered as complete, as this within the knowledge of the present days can be accomplished. Such help furthermore would really be a recompense only from those who, in using this book, derived some practical rural benefit or instructive advantages from its pages.

MELBOURNE, *August*, 1891.

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